the OIL AND GAS JOURNAL

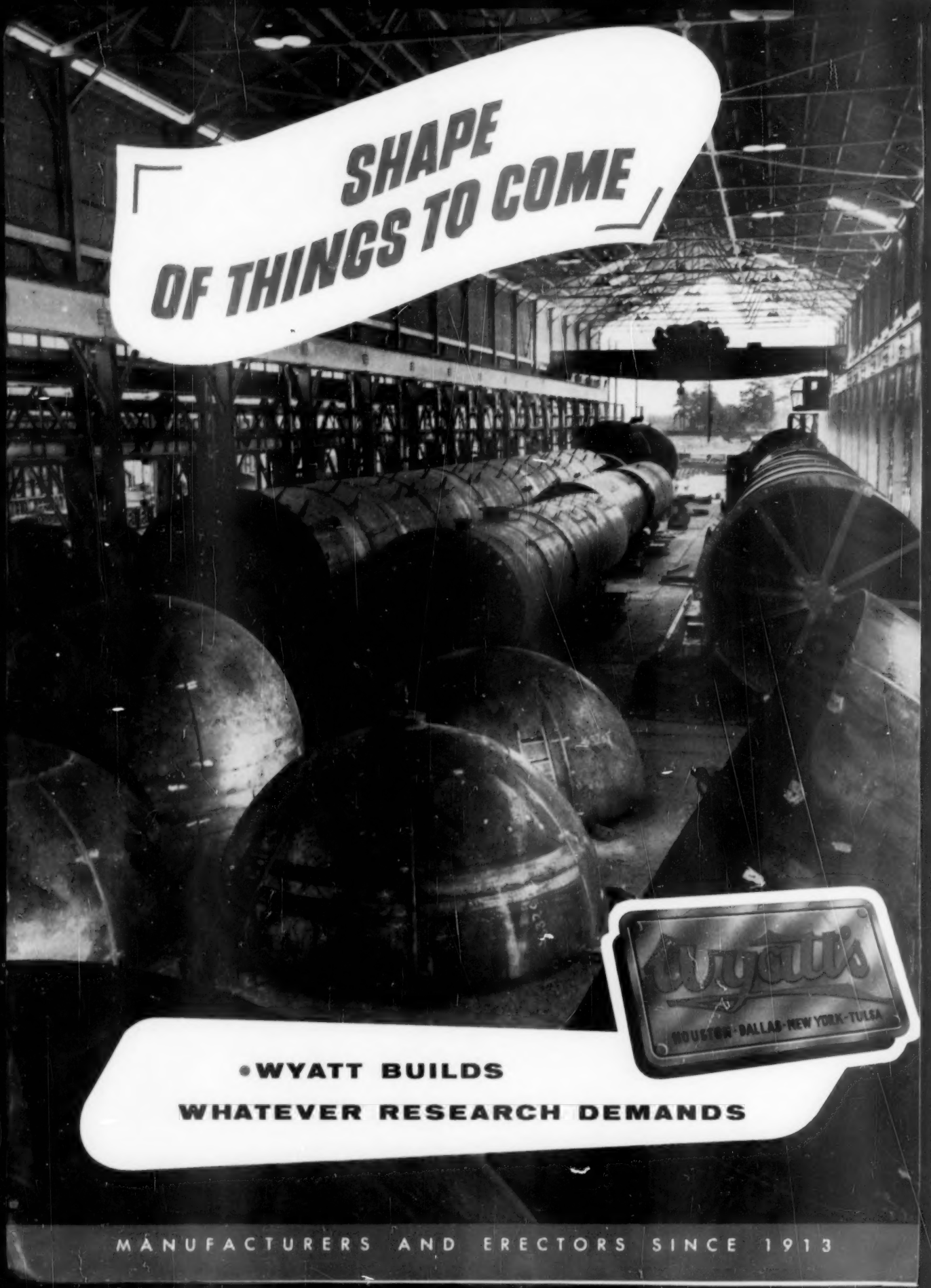
AUGUST 6, 1956

Egyptians cheer Nasser for canal seizure, as oil men gravely ponder . . .

What Suez Crisis Means to Oil

p. 50

How Badly Was Oil Hurt by the Steel Strike? p. 56


SHAPE
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WHATEVER RESEARCH DEMANDS
MANUFACTURERS AND ERECTORS SINCE 1913

A Glance Ahead . . . . at press time

These trends will make TOMORROW'S NEWS

A choice Lake Maracaibo concession in Venezuela has been awarded to Superior Oil Co., Los Angeles, according to reliable but unofficial reports. Superior reportedly was high bidder for a 7,700-acre national-reserve block (GR-75) offsetting Shell and Creole production. It was among six tracts offered July 13.

The minimum bid was set at $600 per acre, but concessions in the same area in June brought as much as $1,100 per acre. The government has not yet disclosed the identity of successful bidders.

California's first intercompany sale of crude oil via automatic custody transfer is scheduled for September 1. Union Oil Co. will buy Yorba Linda field crude from Western Gulf Oil Co. through automatic facilities now being installed. In nearby Brea field, Shell Oil Co. is operating automatic batteries which transfer crude to Shell's pipeline department.

Engineering-contracting firms who guessed wrong on steel prices might find themselves on the short end of turnkey contracts. This will be the case with contractors who took some of the risk to win a competitive job. But there's a sharp trend away from flat-price to cost-plus contracts. One refiner who reports he can't get a turnkey contract anymore attributes the situation to the construction boom. A slowdown might see a reversal of the trend.

Polypropylene is the newest petrochem prospect. One of the polyolefins, it can now be polymerized at low pressures with newly discovered catalysts.

The Italian chemical firm—Montecatini—has unveiled some of its polypropylene products. These include film, fibers, and soft, but strong, molded containers. The fibers reportedly are stronger than nylon and promise interesting applications. Resistance to heat and chemicals is good.

Development of polypropylene could create a strong demand for propylene. L.P.G. sells for about 1 cent a pound, and a pure propylene stream could be fractionated out at a cost well under today's ethylene price of 5 cents per pound.

If a propylene-ethylene battle should develop, it would be another example of the upgrading of petroleum hydrocarbons through improved technology.

Bottleneck removal still looks like one of the brightest opportunities open to refinery engineering staffs.

One independent has increased cat cracking capacity 4,500 bbl. per day (60 per cent conversion level) at a cost of $750,000. This is a unit cost of $166.50 per barrel of daily capacity. The same company has "unbottle-necked" its petrochem unit to increase throughput to 29.4 per cent over design rating.

The OIL AND GAS JOURNAL

AUGUST 6, 1956 • VOLUME 54 • NUMBER 66

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IN THE NEWS

Processing:

Filtrol Interested in Buying U.O.P. Stock ... 53
Processing Briefs ... 59
Shamrock Hires "Safety Detective" in Fire Probe ... 60
Wilcox Shutting Down Its Oklahoma Refinery ... 62
Premium Octane Dips, Regular Rises in July ... 64
Cosden Places Industry's Second Rexformer on Stream ... 67
No Cut-Rate 100-Octane to Be Sold After All ... 67

Production:

West Texas Flood May Boost Recovery 28,000,000 Bbl. ... 55
Humble May Try New Recovery Method in Seeligson ... 60
Alberta Crude Nominations Hit All-Time High ... 62
Commission Making Texas Floods Attractive ... 66
Automatic Custody Transfer Succeeding for Gulf ... 67
Biggest Frac Job Takes Mass of Men, Equipment ... 69
Foreign Output Widens Lead Over United States ... 70

Exploration:

Wildcat Expected to Give Arizona Its Second Field ... 53
City Dump Well Puts Houston in the Oil Business ... 55
British-American Tests Salt-Dome Strike ... 59
Desert Shows Spark Interest in Libya, Arabia ... 71
Let's Not Sell Williston Short ... 143
Nuclear Magnetometer Reveals Structural Grain ... 144
East Texas' Anderson County Is New Hot Spot ... 161

General Interest:

Suez Seizure to Have Wide Oil Repercussions ... 50
Producers Pick up Senate Support to Cut Imports ... 54
Steel Strike Impact Will Linger for a Year ... 56
Humble, Shell Cut West Central Texas Postings ... 59
Union May Ask Industry for 36-Hour Work Week ... 66
Bureau of Mines Maps Research Plans for Year ... 68
Jersey Standard Makes Second Midwest Move ... 69
Creole Plans Marine Terminal for 60,000-Ton Tankers ... 71
Southern California Petroleum Sells Egyptian Stock ... 72

Drilling:

Mud-Service Boat Latest Offshore Innovation ... 62
Russians Claim Time Saved with "Multibore" Drilling ... 72

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

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TECHNOLOGY—OPERATION

Refining-Processing

SPECIAL SECTION: COMPUTERS IN REFINING 75-83

Computers Optimize Gas-Plant Operations 75
By E. V. Merrick
An I.B.M. 650 electronic computer has been used to optimize operation of a Sohio catalytic-reformer gas plant. A 61-hour study on the machine enabled the determination of the effects of all the process variables and pointed the way to changed operating conditions and increased product value.

Digital Computers Speed Gas Analysis 78
By Howard A. Young
The time required for calculating the results of a mass spectrometer gas analysis can be shortened from an hour or more to 10 minutes by substituting a digital computer for a desk calculator.

Computers Aid Gasoline-Blending Operations 80
By K. E. Frye and K. L. Shull
Conventional and special-type computers are being used by Sohio's manufacturing department to save money and manpower, and increase efficiency, accuracy, and speed in gasoline-blending operations.

Reynosa Gasoline Plant Designed for Huge Capacity 89
By John C. Reidel
The new Reynosa absorption plant, just south of the border in the Mexican State of Tamaulipas, has a gas-handling capacity of 300 M.M.c.f.d. Liquids go to the Reynosa refinery for blending into gasoline; gas goes to Texas Eastern.

Nelson Refinery Construction Index 104

On the Job . . . In the Plants 105
Test truck speeds data collection to computers; reactor-tube turnaround made quickly with big cranes; new dry-dye probe eliminates clogged lines.

The Foreman's Page 108

Questions on Technology 109

Pipelining

Electrical Analog Helps Solve Design Problems 98
By Glenn Damewood
The electro-acoustical analog of Southwest Research Institute and the Southern Gas Association is an electrical model of a compressor and its associated suction and discharge piping. Measurements on the analog are equivalent to field measurements.

Pipeline Patrol: Construction Tables 113

Drilling-Production

Why Gas Wells Have Low Productivity 84
By G. W. Tracy
A new method of analysis can now be used to determine the cause of low productivity in gas wells. The basic physical laws for fluid flow have been used in its development.

Mountain Men Try Slim-Hole Drilling 93
By Phillip L. McLaughlin
Slim-hole drilling is getting close scrutiny by Rocky Mountain drillers as one way to lower the cost of finding oil. During the past 5 years, 468 slim holes have been drilled in this area.

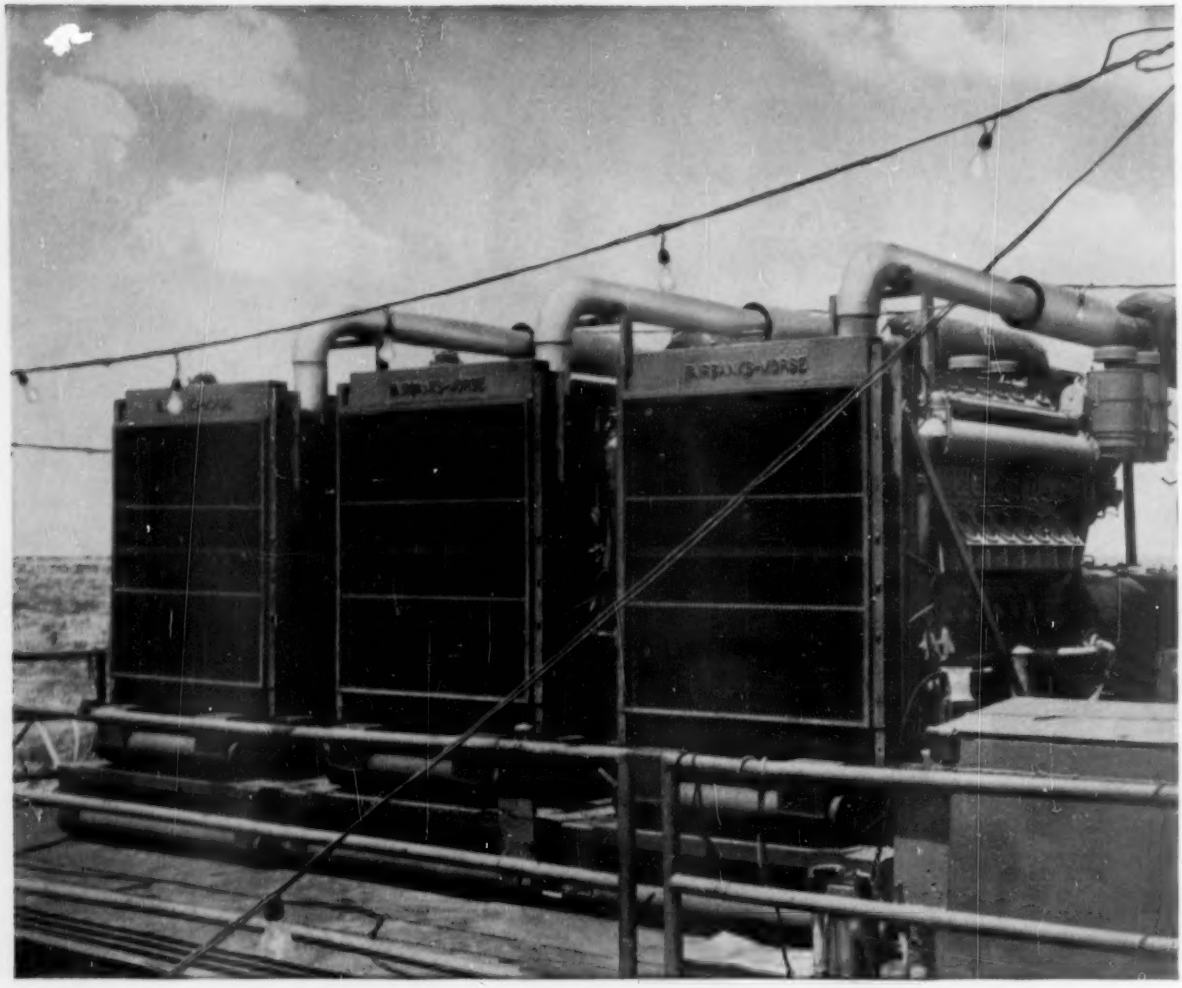
Standardize Rigs and Save 96
By Ed McGhee
Robinson Brothers Drilling Co. has standardized its rigs operating in West Texas and New Mexico to (1) lower investment, (2) keep spare parts inventory down, and (3) make it easier to transfer personnel back and forth.

More Stabilized Condensate from Lease Refrigeration 102
By J. L. Chadwick and J. H. Crow
Lease-operated gas refrigeration gives Delhi-Taylor 6,000 gal. more stabilized condensate per day at its Hagist ranch lease near Freer, Tex., than it was recovering previously.

Modern Drilling 112

DEPARTMENTS

A Glance Ahead	1	On the Job—In the Plants	105	Personals	167
They Say	38	Foreman's Page	108	Deaths in the Industry	169
Calendar of Events	41	Questions on Technology	109	Statistical Summary	171
Journally Speaking	45	Modern Drilling	112	Drilling Statistics	172
Editorial	47	Pipeline Patrol	113	Supply Statistics	173
This Week	49	Drilling Contractors	129	Refining Statistics	174
Watching Washington	58	Equipment Digest	131	Markets	175
International News	70	Equipment Men in News	140	Classified Advertising	176
Books	104	Exploration Highlights	143	Advertisers' Index	181



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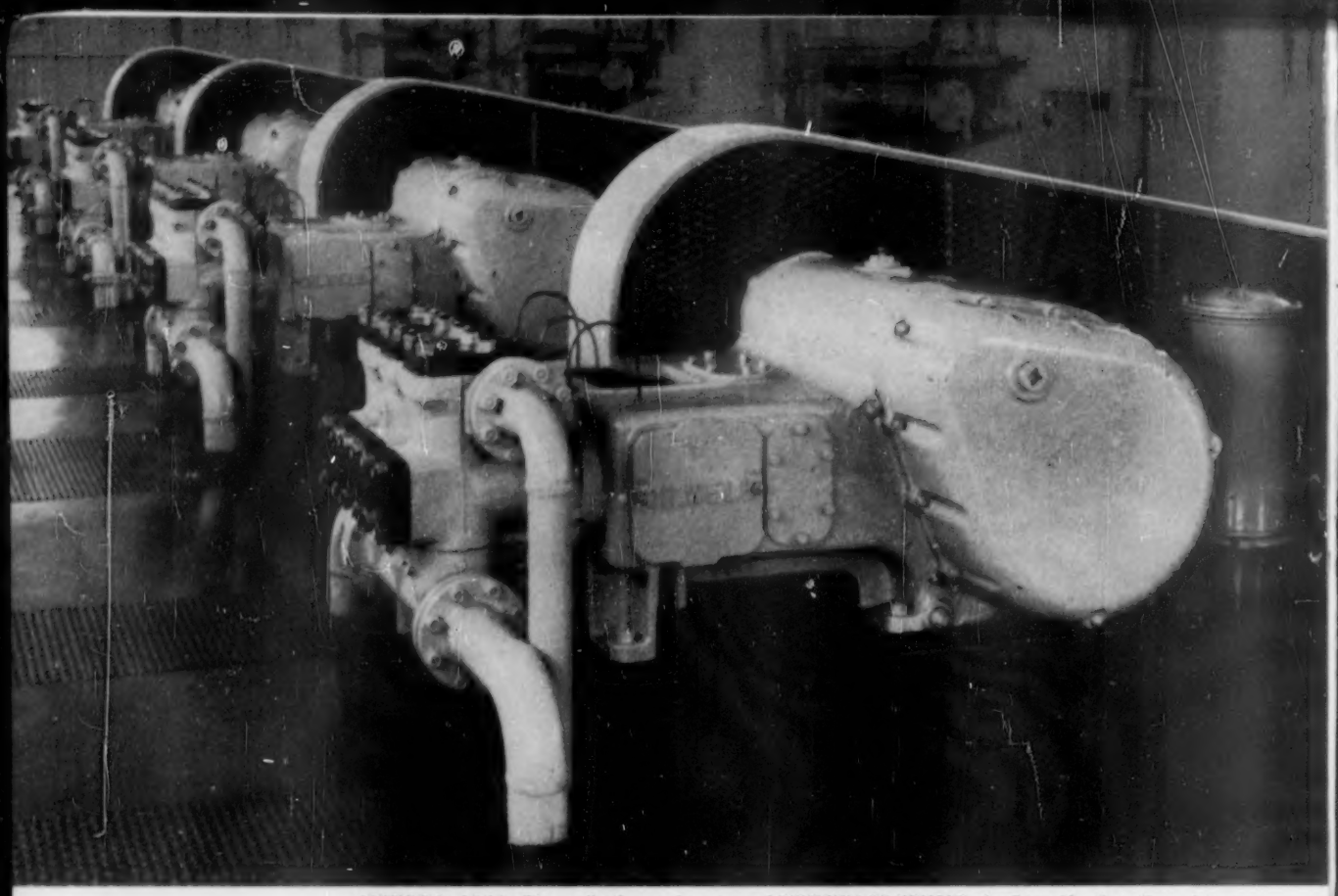

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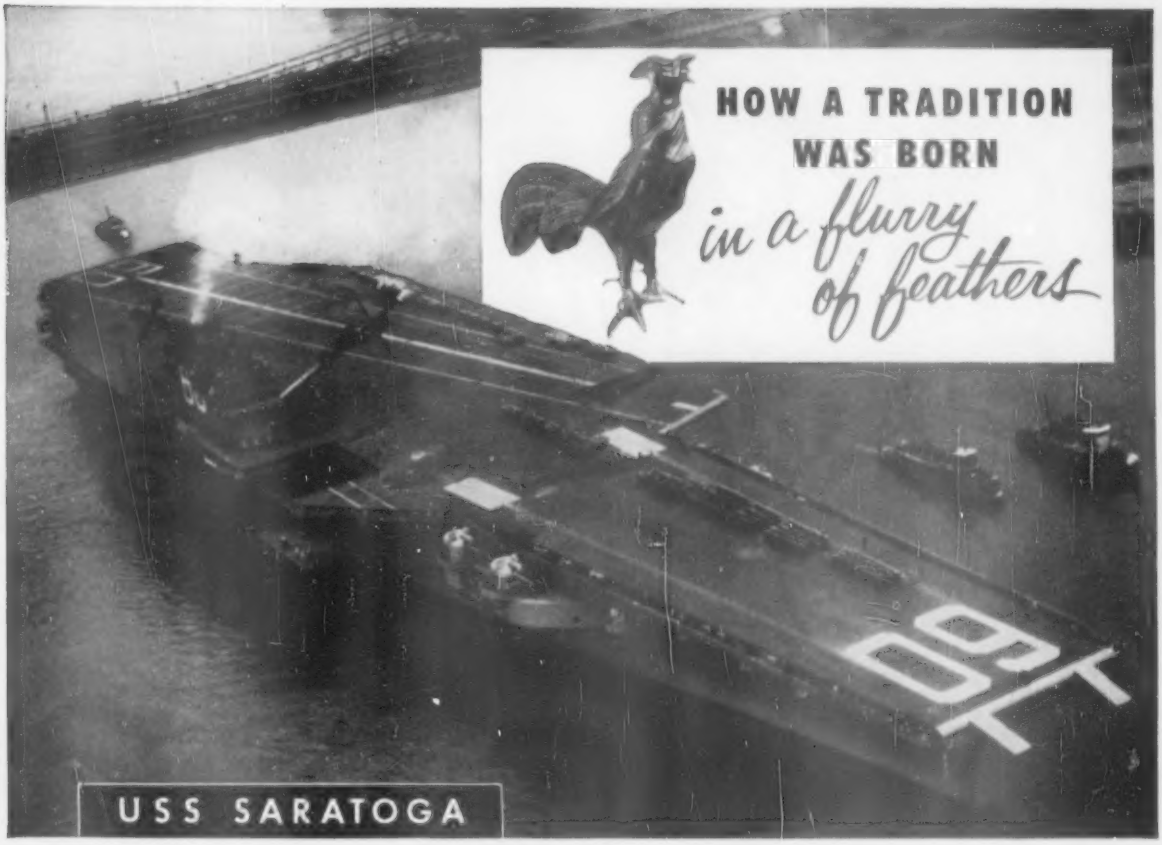

The symbol, and the spirit, of the fighting gamecock lives on with the commissioning of the powerful aircraft carrier, *USS Saratoga*.

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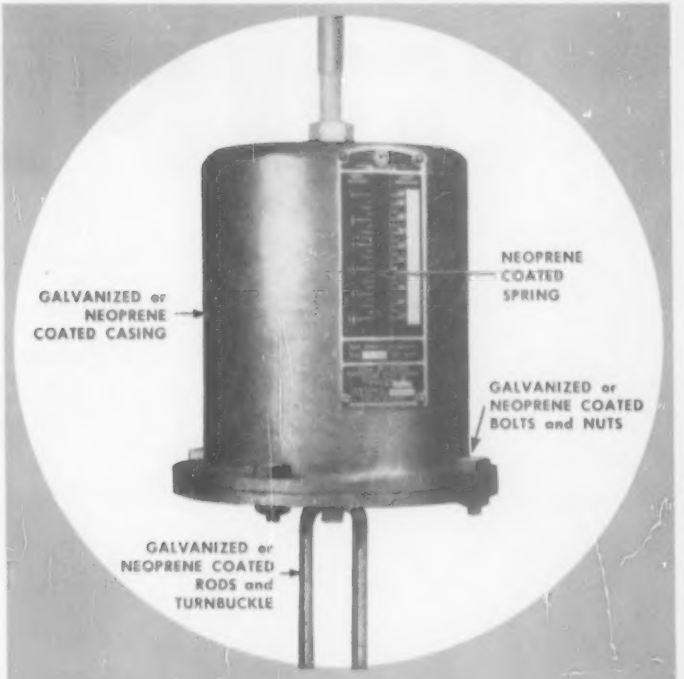
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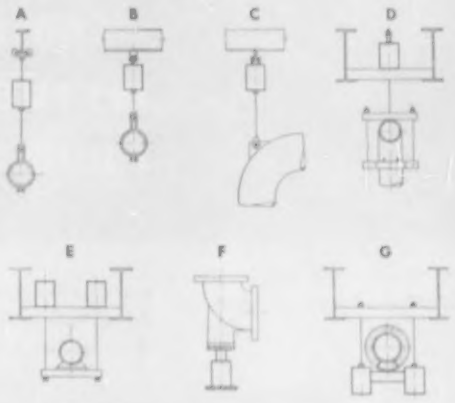

(A) Rod threaded to top cap (B) Furnished with single lug (C) Two lug style (D) Top adjusting (E) Adjustable top and bottom (F) For floor support (G) Trapeze assembly.

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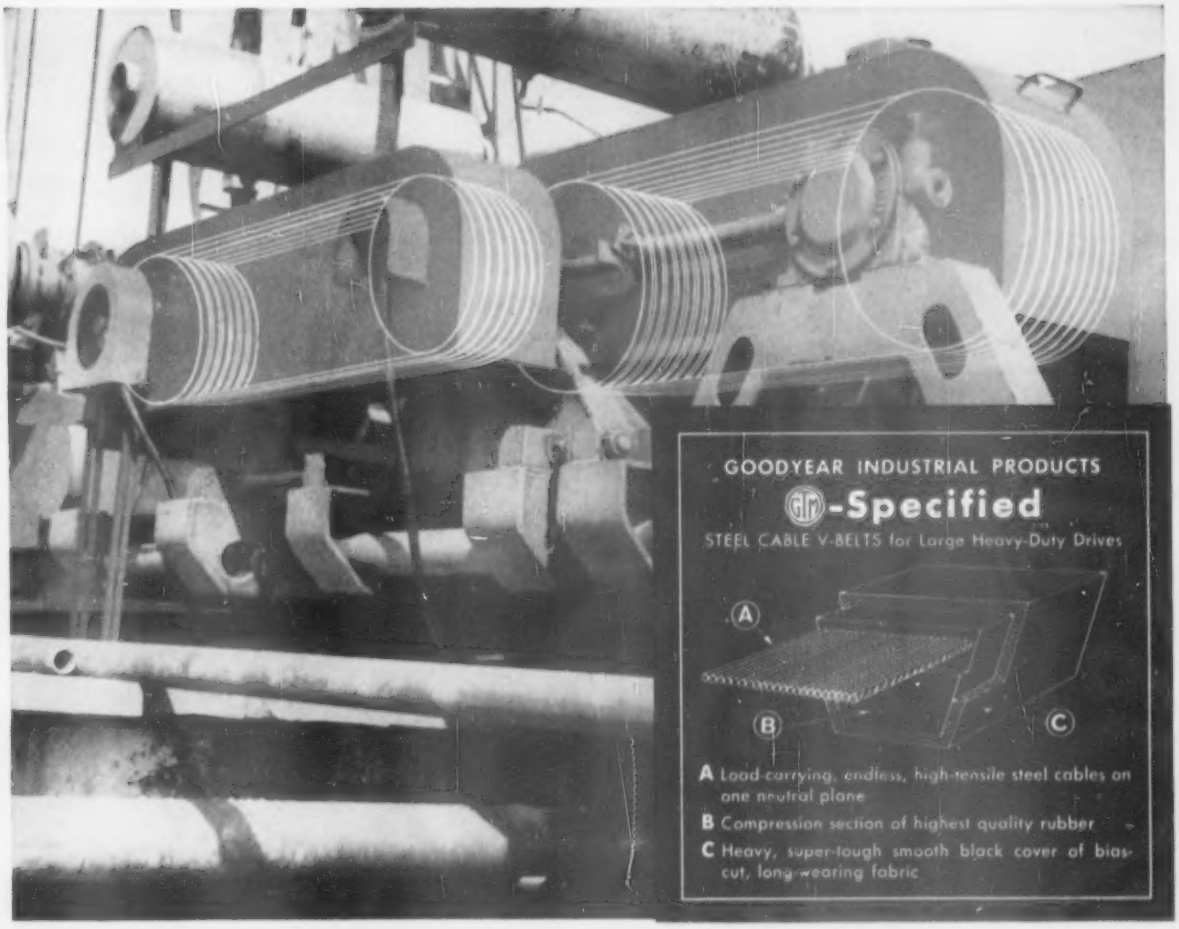
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WHEN other systems were used on the compound and pump drives of this portable rig, service life was low and maintenance high. A change to V-belts was considered, but the operators were wary of the extremely limited take-up space.

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NH_3

3 more ammonia plants by Foster Wheeler

Three major petrochemical manufacturing companies have recently authorized Foster Wheeler to proceed with the design and construction of three Ammonia Synthesis Plants having a combined NH_3 production capacity of 585 tons/day. One of these plants will have a design capacity of 305 tons/day, the largest ever built by Foster Wheeler.

Hydrogen, for all three plants, will be separated from hydrogen-rich tail gas streams from nearby processing units.

These contracts reflect industry's approval of the Casale Process for Ammonia Synthesis and also Foster Wheeler's design, engineering and construction "know how". When these plants are completed, Foster Wheeler will have built —

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Caustic Resistance—film must be inert to the caustic soda used in high pH drilling muds.

Solvent Resistance—film must not be affected by crude oil, diesel oil nor petroleum cleaning solvents.

Abrasion Resistance—should possess maximum abrasion and impact resistance, to withstand rough usage.

Maintenance—must be easily maintained both in small areas by roustabout labor, and in larger areas when general overhaul is economically desirable.

Application Properties—must dry as quickly as possible and be as tolerant as possible of weather conditions. Even the BEST coating is useless if shipyards cannot get it on the structure properly.

PRS

Maximum-resistance coatings are manufactured from all the so-called plastic resins. PRS technicians recommend only the coating BEST suited for the job, whether the application is in offshore • chemical plant maintenance • tanks and tank car linings • petroleum processing and storage vessels and tanks • drum and container linings • tubular goods • concrete coatings • marine craft • other operations where maximum inertness of film is required.

PRODUCTS RESEARCH SERVICE, INC.
BOX 6116 • NEW ORLEANS 14, LA.

PRODUCTS RESEARCH SERVICE, INC.
Box 6116 • New Orleans 14, La.

☐ Please send me copy of your new brochure entitled SURFACE COATINGS FOR OFFSHORE STRUCTURES.

☐ I have corrosion problems other than those associated with offshore. Please send me SURFACE COATING SYSTEMS BOOK, which details those systems most often recommended by PRS for a variety of corrosion requirements.

Name

Company

Address

City State

Position

In the United States and Canada an empire of service — 90 stores, 21 sales offices!

J&L SUPPLY

Customers get new buildings in Wichita Falls, St. Elmo, Big Spring

Everywhere progress in oil — growing dependence on J&L Supply. For J&L Supply customers in Wichita Falls, Texas, a smart new office and store building since April.

In Illinois the J&L Supply store at St. Elmo outgrew the old quarters. Men in oil who depend on J&L Supply needed this new building — and got it last February.

J&L Supply customers in the Big Spring area of Texas had the old store building "bustin' out at the seams". They got a new building in March.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

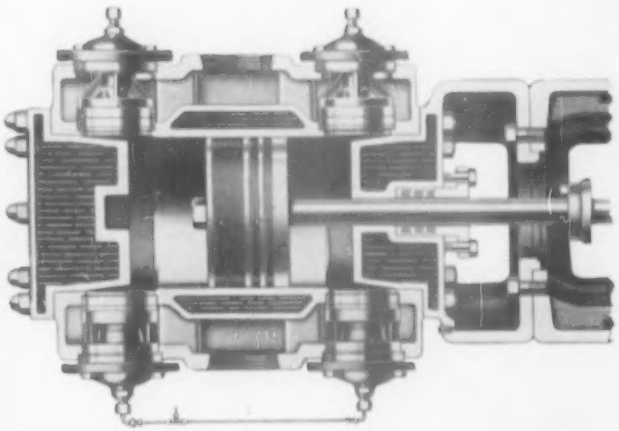
SERVING THE UNITED STATES AND CANADA

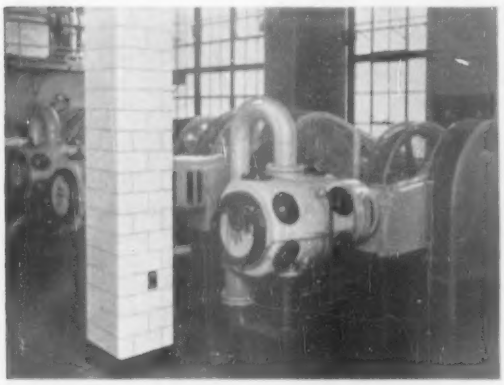
17-I

A dependable supply of oil-free air or gas

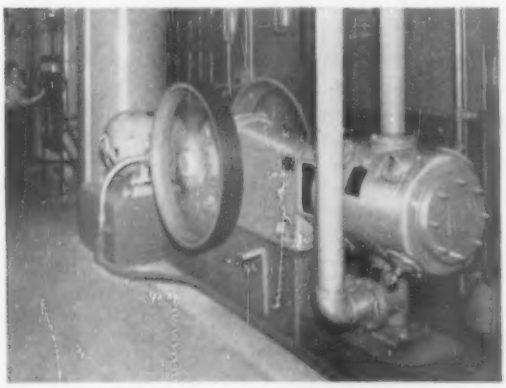
Graphitic-carbon wearing rings and pressure rings prevent metallic contact between the piston and cylinder bore—no oil is used anywhere in the compression cylinder or on the piston rod.

NL Channel Valves are designed specifically for non-lubricated service. Carbon guides protect channel ends and special Teflon strips protect channel interiors and spring ends from metal-to-metal rubbing and wear.





Installed in a large brewery in 1933, this Ingersoll-Rand ES-NL compressor was the first unit ever built with non-lubricated cylinders. It is still in daily service, providing the clean, oil-free compressed air which is vital to product purity. Three other ES-NL compressors, installed since then, are shown in the background.



One of four ES compressors with NL cylinders, supplying oil-free air in the manufacture of super-precision instruments and aircraft ball bearings.

with Ingersoll-Rand ES-NL compressors

In process and manufacturing plants all over the world, the problem of oil contamination in compressed air and gases has been successfully solved by the application of Ingersoll-Rand ES-NL compressors.

The unique NL cylinder design provides compression without oil lubrication—through the use of graphitic-carbon wearing and pressure rings. The ability of these compressors to deliver clean, oil-free air and gas, in continuous, heavy-duty service, has been thoroughly proved in every field of application.

If you have an application where oil-lubricated compressor cylinders cannot be used, ask your Ingersoll-Rand representative about the ES-NL compressor, sizes 5 to 150 horsepower—other Ingersoll-Rand NL compressors to 1000 hp.

Ingersoll-Rand

1-422 11 Broadway, New York 4, N. Y.

COMPRESSORS • CONDENSERS • AIR & ELECTRIC TOOLS • PUMPS • ROCK DRILLS • GAS & DIESEL ENGINES

In JENKINS *Monel-seated Bronze Gates*

THE WEDGE TAKES THE WEAR - *and spares the rings*

Easy replacement of the wedge only — right on the line — restores full efficiency

THE MONEL SEAT RINGS are expanded into the body to assure a positive, leak-proof joint. Exhaustive tests in typical monel-seated gate valve services show that this permanent all-around support of the rings is essential to guard against deforming, loosening, or shifting.

THE RENEWABLE WEDGE (bronze or nickel alloy) has excellent wear resistance, but has a lower degree of hardness than the heat-treated Monel rings, which have optimum resistance to erosion and corrosion as well as abrasion. Thus, wear of the wedge leaves the rings relatively unaffected. When necessary to renew the wedge, you simply remove the valve bonnet, slip the old wedge off the stem, and slip on a new one.

GET PRACTICAL, LOW-COST RENEWABILITY in the valves you choose for the tough, punishing services that require Monel-seated gates. Compare . . . there is nothing simpler, faster, or more economical than Jenkins replaceable wedge design — and you also get the *plus* of Jenkins *extra value* in every other feature. Jenkins Bros., 100 Park Ave., New York 17, New York.

MADE WITH BRONZE OR NICKEL ALLOY WEDGE

The bronze wedge provides lasting economy for most applications. The nickel alloy wedge provides extra resistance where rapid wear and corrosion are factors.

JENKINS BRONZE GATES WITH MONEL SEAT RINGS

200 psi	300 psi
Fig. 270-U, Bronze Wedge	Fig. 280-U, Bronze Wedge
Fig. 270-UN, Nickel Alloy Wedge	Fig. 280-UN, Nickel Alloy Wedge
Fig. 270-UL, Bronze Wedge, U.L. approved for L.P.G. Services	350 psi
	Fig. 280-UX, Bronze Wedge

JENKINS BRONZE GATES INCLUDE 40 DIFFERENT PATTERNS

125 • 150 • 200 • 300 • 350 psi SOLID WEDGE • SPLIT WEDGE
SCREWED • FLANGED • SOLDER END • SOCKET END QUICK OPENING

Call your local Jenkins Valve Distributor for complete information.

JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND

SINCE 1864 TRADE JENKINS MARK

Jenkins Bros.

Why wait until WINTER?

You are looking ahead toward preventing a probable turndown of a tank of oil when the first cold snap comes—when you purchase a treater for new production now while there is more time for adequate consideration of the exact need. Maloney-Crawford's line of treaters will handle any problem economically whether it involves loose or tight emulsions, heavy foaming oil, or considerable free water.

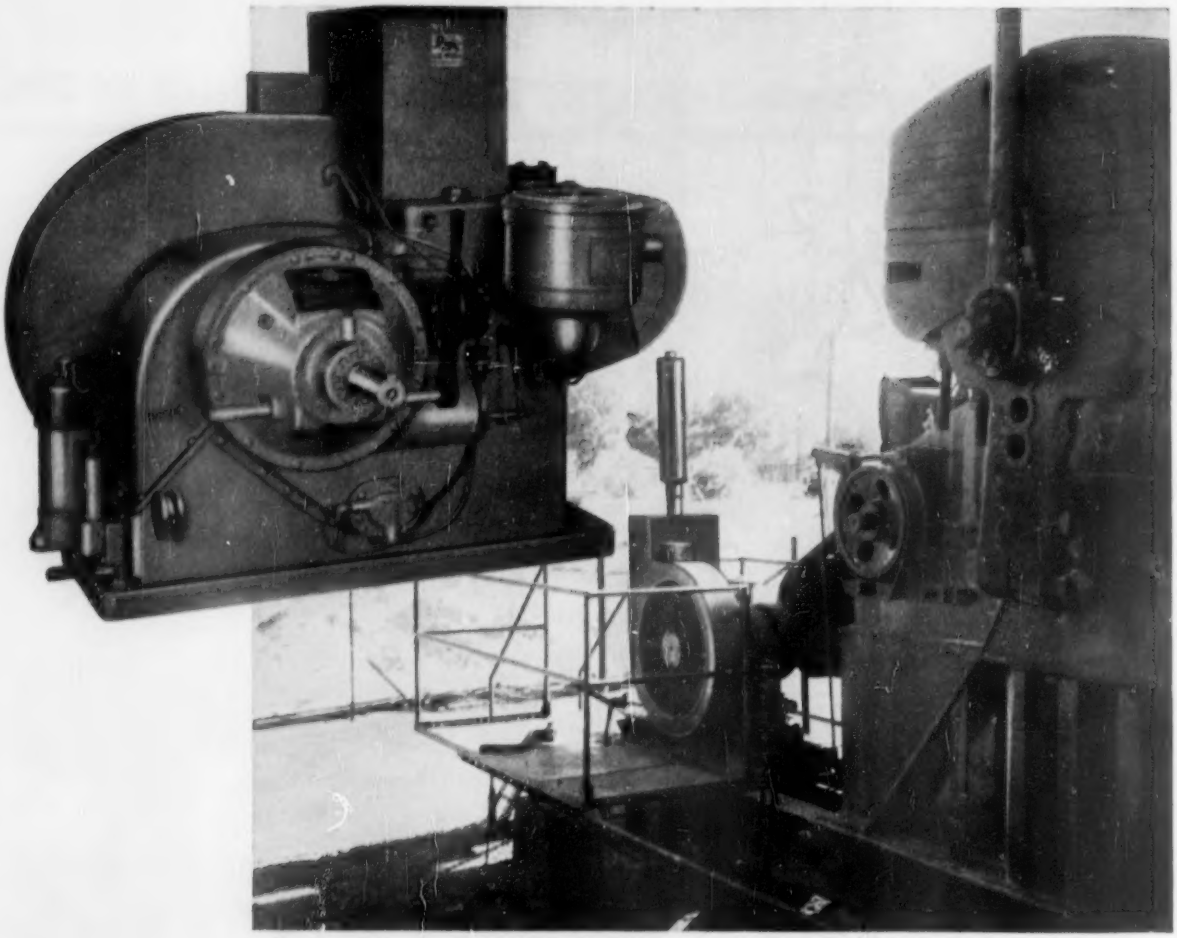
Large free water sections, generous size furnaces, adequate settling sections, large efficient downcomers feature M-C treaters. Available in horizontal or vertical type; atmospheric or pressure.

See a Maloney-Crawford representative before you buy a treater.

MALONEY-CRAWFORD TANK & MFG. CO.

MALONEY-CRAWFORD TANK & MANUFACTURING CO.

FACTORY AND GENERAL OFFICE: 38 North Peoria—Box 659—Tulsa, Oklahoma
EXPORT REPRESENTATIVE: Baird Lines—1017 Grand Central Terminal Bldg., New York 17, N. Y.
CANADIAN REPRESENTATIVE: Maloney-Crawford Tank & Service Company, Ltd.—Edmonton
TEXAS PANHANDLE REPRESENTATIVE: Atlas Tank Company—Pampa, Texas



Total Operating Cost Only 1.2 Mills per Hp Hour

. . . that's why it pays to do your pumping with Le Roi A288's

ACCORDING to the major oil company using this 26.3 max. hp A288, this operating cost is lower than that of any of their other engines.

And here are some of the reasons why the A288 cuts the cost of pumping — why it can run two weeks at a time without inspection.

Patented, "vaporizing-condensing" cooling system seldom needs make-up water. Uniform high temperatures reduce corrosion and sludging.

No superfluous acccessories like grease fittings, conventional-type fan and belts to need attention.

Generous crankcase permits long intervals between oil changes — and no shutdown is required to inspect oil level or add oil.

And performance-wise, you can't beat the A288, or the smaller 14.9 max. hp A114 sister engine, either. One typical installation has more than 47,000 hours on it. Stamina like this is one reason why the A288 is the only pumping engine recommended by a major user for continuous service *unattended for up to two weeks' time.*

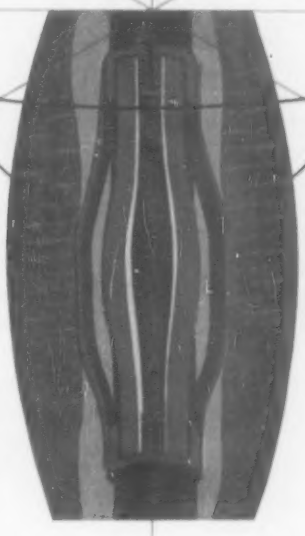
Standardize on A288's and watch your pumping costs drop. You can get them from your supply house, or your Le Roi distributor. Or write us for our latest bulletin.

LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 1, Wisconsin. Oilfield Headquarters, Tulsa, Oklahoma

P-130

MORE POSITIVE CENTERING
TO PROLONG WELL LIFE



HALLIBURTON'S S-3 CASING CENTRALIZER

Casing permanently cemented in the hole increases the economic life of a producing formation—provided the casing is properly centralized.

With Halliburton's S-3 Casing Centralizer, cement channeling is minimized by allowing cement to surround casing more completely... permitting more uniform distribution and a better bond to both casing and formation. The powerful springs bow their backs like a range bull and force the casing away from the wall at extremely tight points where hole deviation is abnormal...and hold it on center while casing is being cemented.

STRENGTH WITH STAMINA

The heat-treated steel springs which give the S-3 its strength and stamina have proved their calibre under torture tests that show as little as 3.94% loss in bowed height after permanent set. These springs are lap-welded to hinge-type end bands for greatest protection against breaking and to eliminate deflecting over a sharp edge when flattened.

MORE FOR THE MONEY

Since each spring does more, positive centering is possible with fewer centralizers. This not only cuts initial costs; it means extra advantages in freer circulation in the annulus, faster installation and greater overall economy... plus prolonged productive life for the well.

Protect the life of your well by starting with positive centering and more uniform cementing. Specify Halliburton's S-3 casing centralizer for your own satisfaction throughout the life of the well. Call your nearest local or regional office of the Halliburton Oil Well Cementing Company.

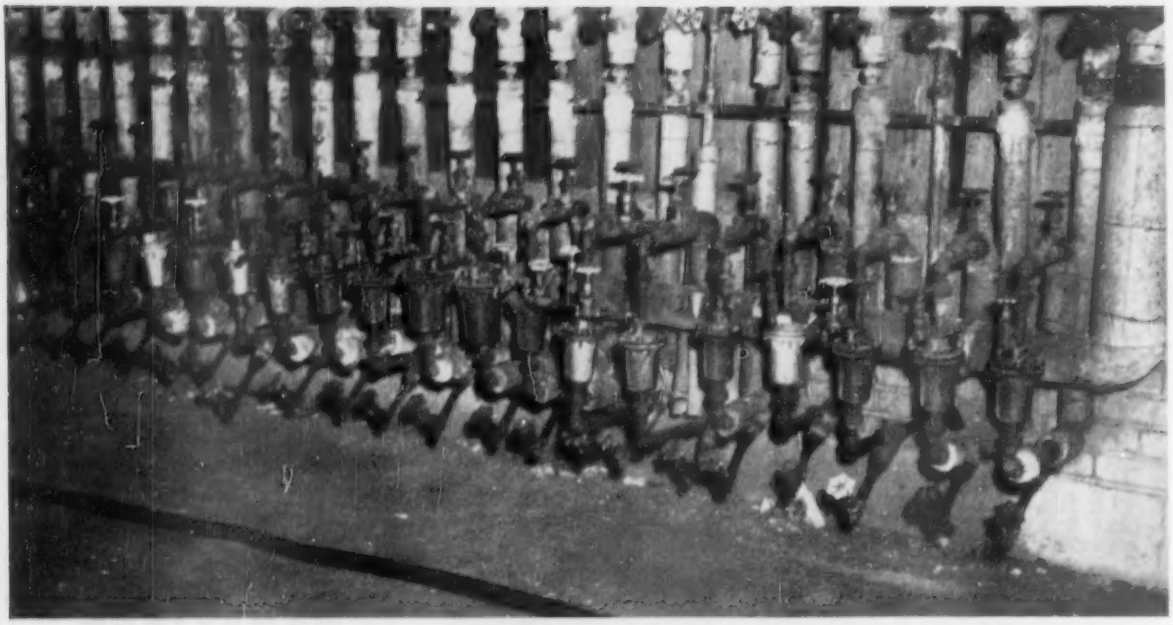
COMPLETE DATA SENT ON REQUEST

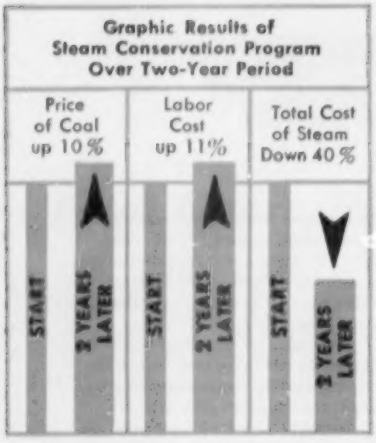
Add this valuable information to your Halliburton Service File

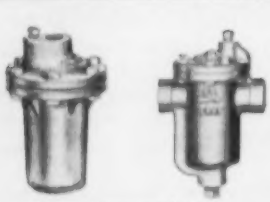
HALLIBURTON
CEMENTING EQUIPMENT

250 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

How a Major Chemical Company Cut Steam Costs $100,000 Annually







Trap sizes and styles
for every condensate drainage job.

Armstrong Traps were a "Major Factor" in Steam Conservation Says Chief Engineer

Steam waste has a way of creeping up on you. Especially in older plants. The losses can make a staggering total.

Plants looking for a way to fight rising costs can well take a page from the 8-point steam conservation program that netted a major chemical plant $100,000 annual saving:

1. **Waste steam utilized** — all flash steam recovered for building heating.
2. **New steam traps installed** — Armstrong traps replaced old traps throughout the plant, indoors and out.
3. **Steam leaks repaired.**
4. **Insulation repaired.**
5. **All condensate recovered.**
6. **Steam piping simplified.**
7. **Steam turned off when not needed.**
8. **Preventive maintenance improved** to insure a continuous checkup on sources of waste.

In commenting on the program, the Chief Engineer of the plant stated, *"4000 new Armstrong steam traps were one of the major factors in conserving steam. The traps, plus improved installation practice, have reduced annual trap maintenance parts and labor by $25,000 as compared to traps previously used."*

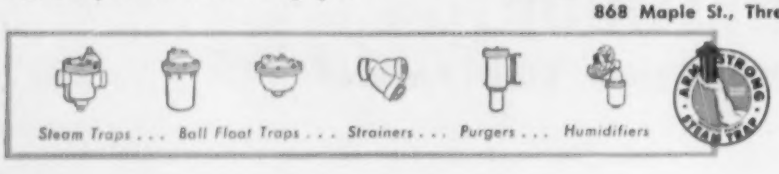
Want all the facts? Tips on cost-saving standardized trap hookups? Facts about Armstrong traps? Ask for:

1. The No. 1, 1956 issue of the Armstrong Trap Magazine containing complete details, drawings and photos.

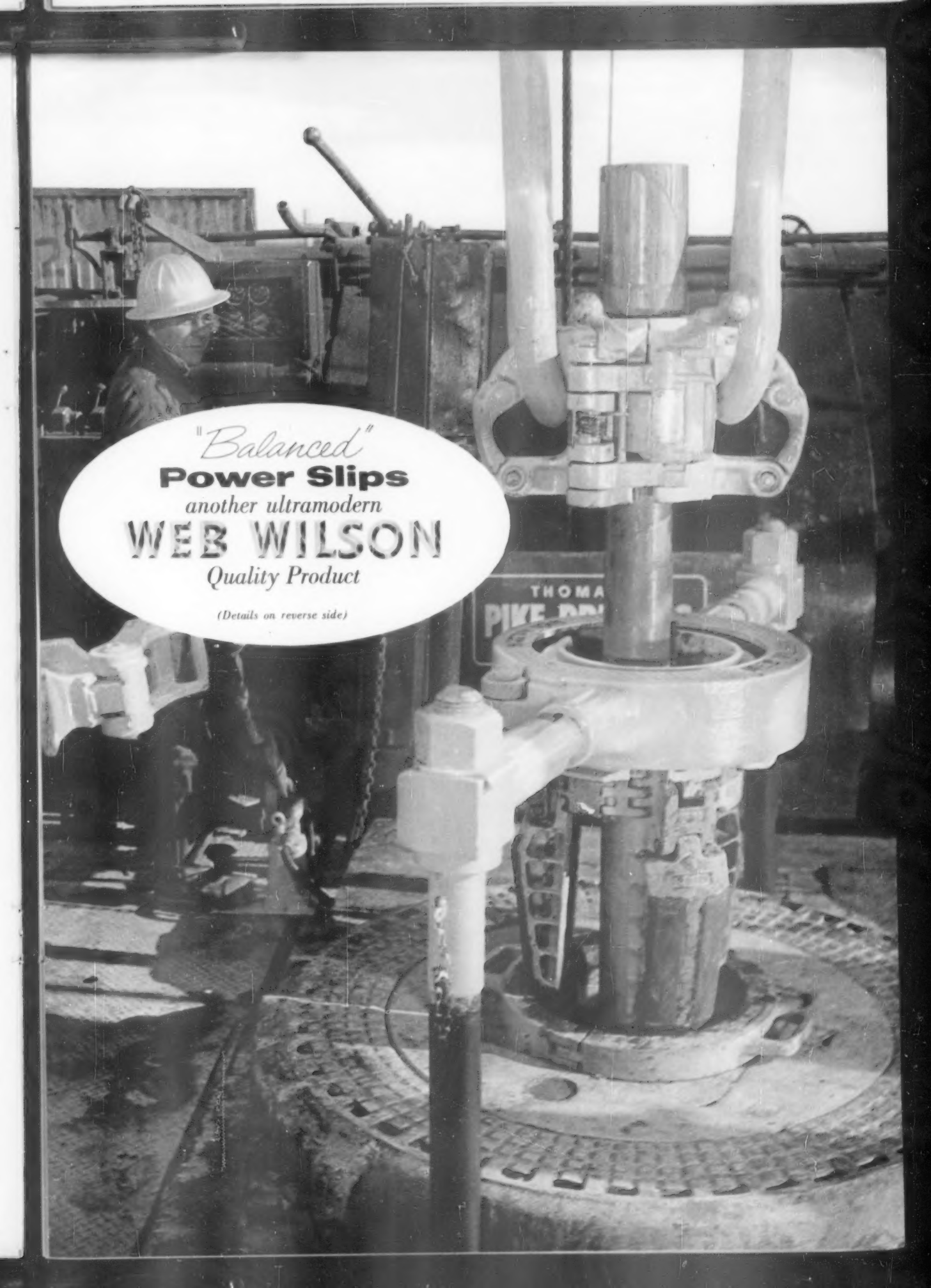
2. The 44-page Armstrong Steam Trap Book, a fact-full guide to better trapping.

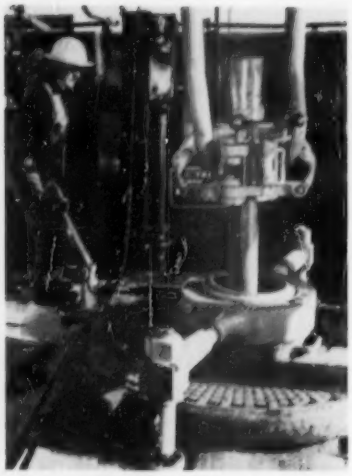
Call your local Armstrong Representative or write:

ARMSTRONG MACHINE WORKS
868 Maple St., Three Rivers, Michigan

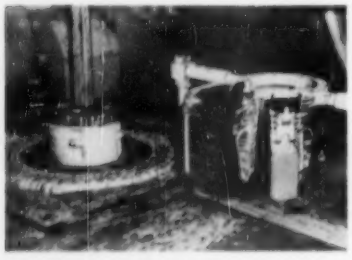


ARMSTRONG STEAM TRAPS


"Balanced"
Power Slips
another ultramodern
WEB WILSON
Quality Product
(Details on reverse side)



With a touch of his foot, the driller sets or retracts the slips.



The slips can be swung away from the table on either of the two posts; or

lifted and set on a stand. The retracted posts are covered with steel plates.

NOW, WEB WILSON "FIELD PROVEN"

Quality...

PROVIDES LONGER LIFE FOR DRILL PIPE

Here is a power slip for the fast, safe handling of drill pipe, without undue scoring and eventual "bottlenecking".

The WEB WILSON "Balanced" Power Slip has no cantilever arms extending across the rotary table, but is *permanently* "balanced" *both horizontally and vertically*, when installed, and *no further adjustments are needed.*

"Balance"—which means *perfect, permanent alignment*—permits these slips to *set simultaneously* around the drill pipe, with *positive, uniform gripping* action that ensures safety to the crew, to the drill pipe, and to all rig equipment. There is no unequal stress or strain—no undue scoring—and therefore, no tendency to "bottleneck" the drill pipe.

SIMPLE, PERMANENT INSTALLATION—To install Web Wilson "Balanced" Power Slips, sturdy brackets are welded to the rotary *base* for holding strong supporting posts on opposite sides of the rotary *table*. Although the slips are rigidly and accurately attached, only a few seconds are needed to loosen one bolt and swing the assembly away from the table. If desired when drilling is resumed, the entire Slip Assembly can be quickly released, lifted, and either laid down or placed on a convenient stand out of the way. The cylinders are then retracted, covered with steel safety plates, and the working area is left free and safe.

SAFER FOR CREW AND RIG—than when hand slips are used. Stopping the pipe and setting the slips is controlled by *one* man—the driller—who has a clear view so that he can set the slips safely with minimum danger of "bottlenecking" the drill pipe. The driller can stop the pipe—hold it momentarily—then, with a touch of the foot on the foot pedal, can set the slips. There is no unnecessary shock to score and bottleneck the drill pipe—no jerk, jar, or undue strain on other rig equipment.

These modern "Balanced" Slips offer many other operating advantages and safety features... It is never necessary to "strip" the slips over the drill pipe. The assembly is "Free Floating" for rotation with the table without unnecessary cams, bearings or rollers, which cause trouble and expense. The slip segments are inter-connected by strong linkage so that they *set* and *retract* simultaneously, and are held wide open to pass any protectors or tools that will go through the master bushing. Safety Stops prevent dropping of the pistons and setting of the slips in event of air failure. No substructure alterations are required; the slips can be installed in 3½ to 5 hours, without special tools; dismantling for moving is done in a few minutes.

WEB WILSON

WEB WILSON OIL TOOLS, INC. • LOS ANGELES • DALLAS • NEW YORK

MAIL ADDRESS: BOX 72096, LOS ANGELES 2, CALIFORNIA

A four-color illustrated brochure contains complete details, dimensions and operating data. May we send you a copy?

Printed in U.S.A.

Sound from Teeth to Hub

This is a mighty rugged spur gear, as indeed it would have to be. It is slated for use in a diesel locomotive, and here the description "heavy-duty service" fits like a glove.

The gear and others like it were fashioned from Bethlehem circular steel blanks, which are both forged and rolled. The forging-and-rolling operation is a unique single-step process that results in uniform density, highly desirable grain flow. The solid, homogeneous metal is easy to machine. To sum it all up, the blanks are *reliable*, all the way through. They make possible gears that are sound from teeth to hub.

Bethlehem forged - and - rolled blanks are produced in many sizes, the usual range being 10 to 42 in. OD. In addition to their uses in the making of gears, they are also recommended for sheaves, crane wheels, and other circular steel products. A wide choice of sections is available. Write for the full story.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

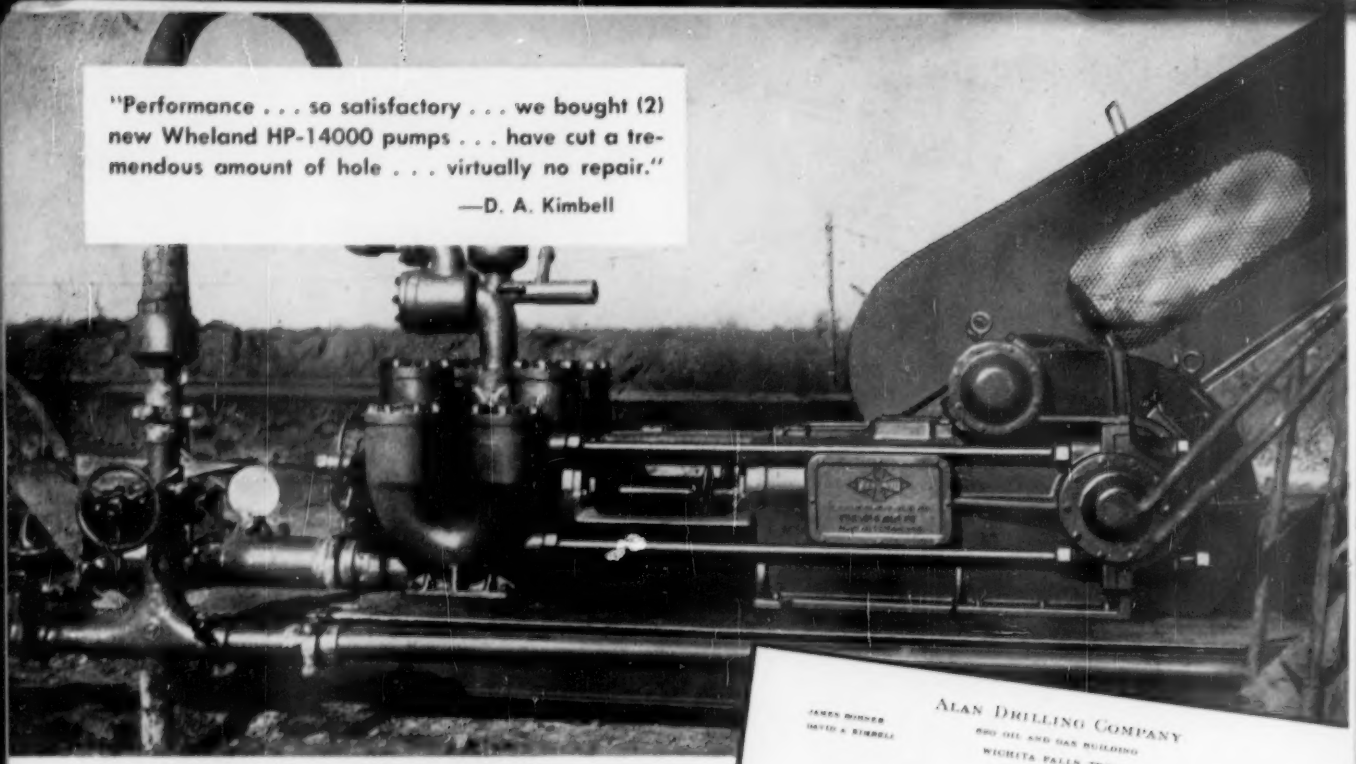
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

"Performance . . . so satisfactory . . . we bought (2) new Wheland HP-14000 pumps . . . have cut a tremendous amount of hole . . . virtually no repair."

—D. A. Kimbell



One of the field proven Wheland HP-14000 pumps operated by the Alan Drilling Co.

OUTSTANDING PERFORMANCE!
DEPENDABLE OPERATION!
LOWER MAINTENANCE!

WHELAND HP-14000

7-1/2"x14" DUPLEX SLUSH PUMP

350 Horsepower Nominal Input at 60 RPM

Discharge pressure with 7 ½" liners 838 PSI

Discharge pressure with 5 ½" liners 1627 PSI

Built for fast, steady operation!

Delivers more pressure per pound of pump!

write for detailed bulletin

ALAN DRILLING COMPANY

JAMES BURKE
DAVID A. KIMBELL

800 OIL AND GAS BUILDING
WICHITA FALLS, TEXAS

March 8, 1956

Mr. Gordon P. Street, President
The Wheland Company
Chattanooga, Tennessee

Dear Mr. Street:

We commenced operations as a drilling company in 1952 with the purchase of a second-hand rig which included an old-style Wheland HP-11000 pump.

This ancient pump's performance was so satisfactory that when we began acquiring new machinery, one of the first items we bought was the new Wheland HP-14000 pump. This was followed about a year later with the purchase of another new HP-14000 Wheland pump. These two new pumps have cut a tremendous amount of hole in Jack, Young, Throckmorton, Grayson and Cooke Counties, Texas, with virtually no repair expense. Incidentally, the old Wheland HP-11000 is still running nearly every day as a standby on our largest rig.

We now operate three rigs in North Texas and Southern Arkansas, and of the four pumps involved, three are the Whelands referred to above. We drill contracts, interest deals, and for our own account, from 2000–9000 feet.

Yours very truly,

ALAN DRILLING COMPANY

D. A. Kimbell

WHELAND

ROTARY DRILLING MACHINERY

THE WHELAND COMPANY

CHATTANOOGA, TENNESSEE, U.S.A.

DRAW WORKS • SLUSH PUMPS • ROTARIES

CROWN BLOCKS • TRAVELING BLOCKS • SWIVELS

DOMESTIC DISTRIBUTORS: INDUSTRIAL SUPPLY COMPANY, INC.—Main Office: Wichita Falls, Texas • HOUSTON OIL FIELD MATERIAL COMPANY, INC.—Main Office: Houston, Texas • JONES AND LAUGHLIN STEEL CORPORATION, SUPPLY DIVISION—Main Office: Drawer 2481, Tulsa 2, Oklahoma.

EXPORT DISTRIBUTORS: LUCEY EXPORT CORPORATION—233 Broadway, New York 7, New York—Broad Street House, London, E. C. 2, England.

You belong here, too! You may be anything from refinery chemist to driller. But as an oilman, you help the farmer feed himself and 18 others—triple his great-grandfather's food production. Oil provides the energy for horsepower to replace manpower. Oil helps keep farm crops and stock thriving, farm families comfortable. If you hear unfair criticism of oilmen, remember how we serve the farmer. In fact, oil has an outstanding record of serving *everybody*. It's our job to say so . . . loud and strong! **SHELL OIL COMPANY**

Where power's needed— MACK'S GOT IT!

Macks have the muscles needed to move heavy oil field machinery and equipment, according to Glasscock-Wilson, Inc., drilling contractors of Shreveport, Louisiana.

And they should know! Their Macks have to move big loads of oil field machinery and equipment over rough, marshy terrain without miring in, and travel on highways at good speeds as well.

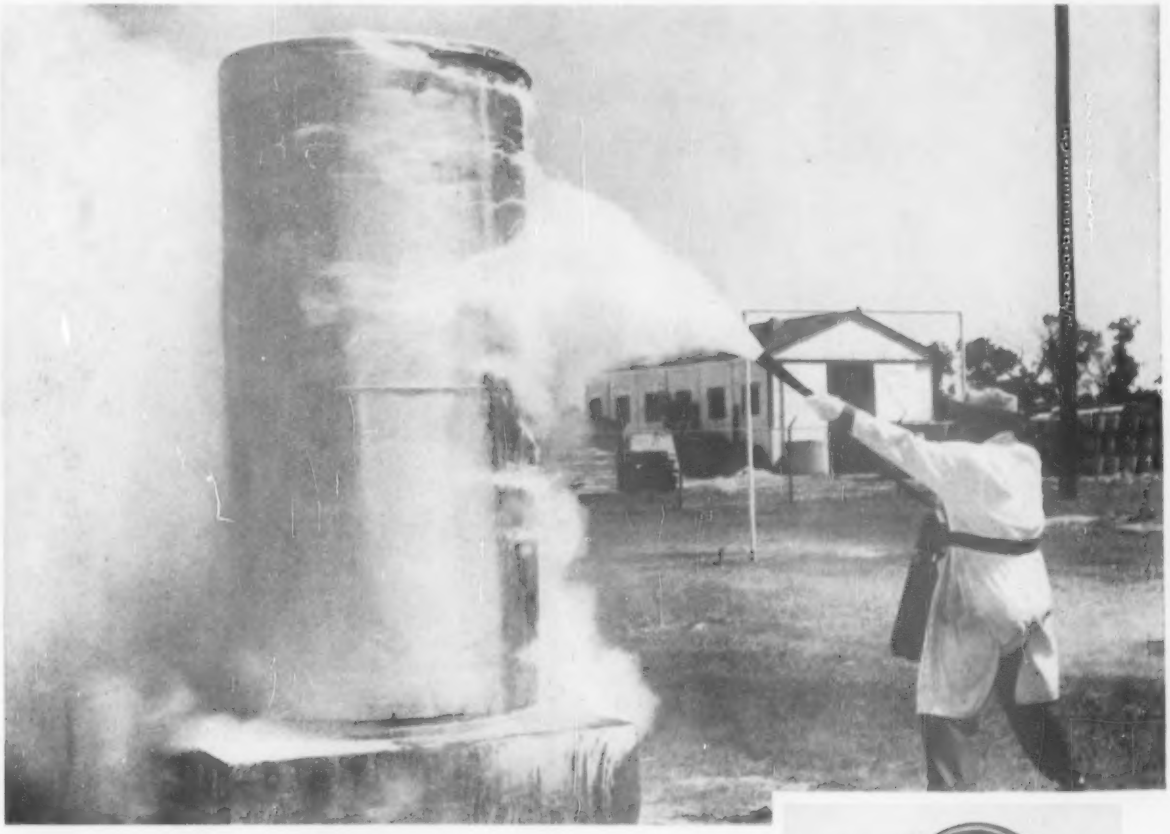
Thanks to Macks' combination of Thermodyne® power, heavy-duty Balanced Bogie and Power Divider, plus all their other Mack-built components, Macks can be relied upon to get the load through on schedule. As Glasscock-Wilson reports: "We find that our Mack units are highly dependable, give excellent performance, and have low over-all maintenance cost."

Here's just one more example of the way that Macks are handling the Mack-sized jobs in the petroleum industry—all the way from exploration through refined product delivery, setting records that no other make of truck can match for low-cost, profitable performance.

MACK TRUCKS, INC., Plainfield, New Jersey. IN CANADA: Mack Trucks of Canada, Ltd.

3719

STORAGE TANK FIRES!



Kill 'em fast with Kidde dry chemical extinguishers!

WHEN FIRE STRIKES oil, gasoline or other flammable liquids, put it out *fast* with Kidde Portable Dry Chemical Extinguishers!

With Kidde Dry Chemical Portables, you simply aim the horn, pull the fast-action trigger, and the most stubborn fire is out immediately. Even in the hands of the most inexperienced operators, these portables give excellent results.

Featuring Kidde's patented diffuser horn which gives you up to 44% more fire-fighting coverage than ordinary dry chemical extinguishers, Kidde Dry Chemical Portables come in cartridge-operated models of 20 and 30-pound capacities and pressure-operated units of 5 and 10 pounds.

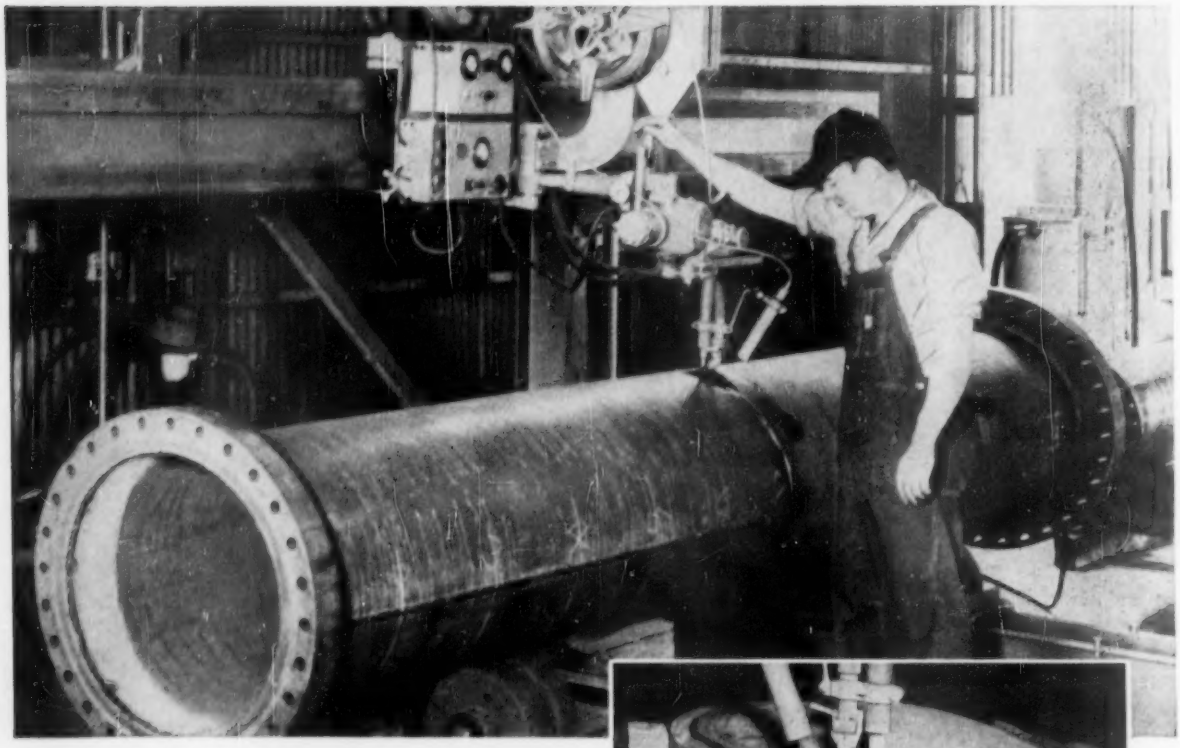
Kidde pressurized models have easy-to-read dustproof gauges, and can be charged to U. L.-approved working pressure (150 pounds) at any commercial air pump. For extra fire-fighting punch, the 10-pound pressurized unit may be charged to 250 pounds.

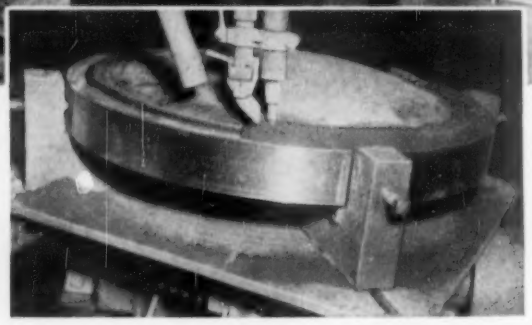
For more information on Kidde's complete Dry Chemical Line, write today for the Kidde P-8 Catalog.

Kidde 30-pound dry chemical portable

Kidde

Walter Kidde & Company, Inc.
854 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada Ltd.
Montreal—Toronto





X-RAY-QUALITY WELDS ...75% FASTER *with* UNIONMELT WELDING

Top-quality welds are a must to assure the maximum service life of parts subject to high pressure and temperature. Like many manufacturers of pressure units, the Western Supply Company, Tulsa, Oklahoma is using UNIONMELT welding to make X-ray-quality welds (in heat exchanger shells) at new high speeds.

*** HIGH SPEED:**

UNIONMELT welding speeds average 15 to 19 in. per min.—this is as much as 75 per cent faster than welding methods previously used. The steel parts welded range from ½ to 3 in. in thickness, and welds are made in from one to three passes.

*** REDUCES GRINDING:**

Since UNIONMELT welding produces smooth, flat weld beads, the need for grinding completed welds has practically been eliminated—further reducing production costs.

UNIONMELT welding is the fast, efficient method of fabricating metals thicker than 18 gage. UNIONMELT welding makes possible increased fabricating speeds and lower production costs. Learn the details—call your local LINDE Representative for more information on UNIONMELT welding, and start saving today.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
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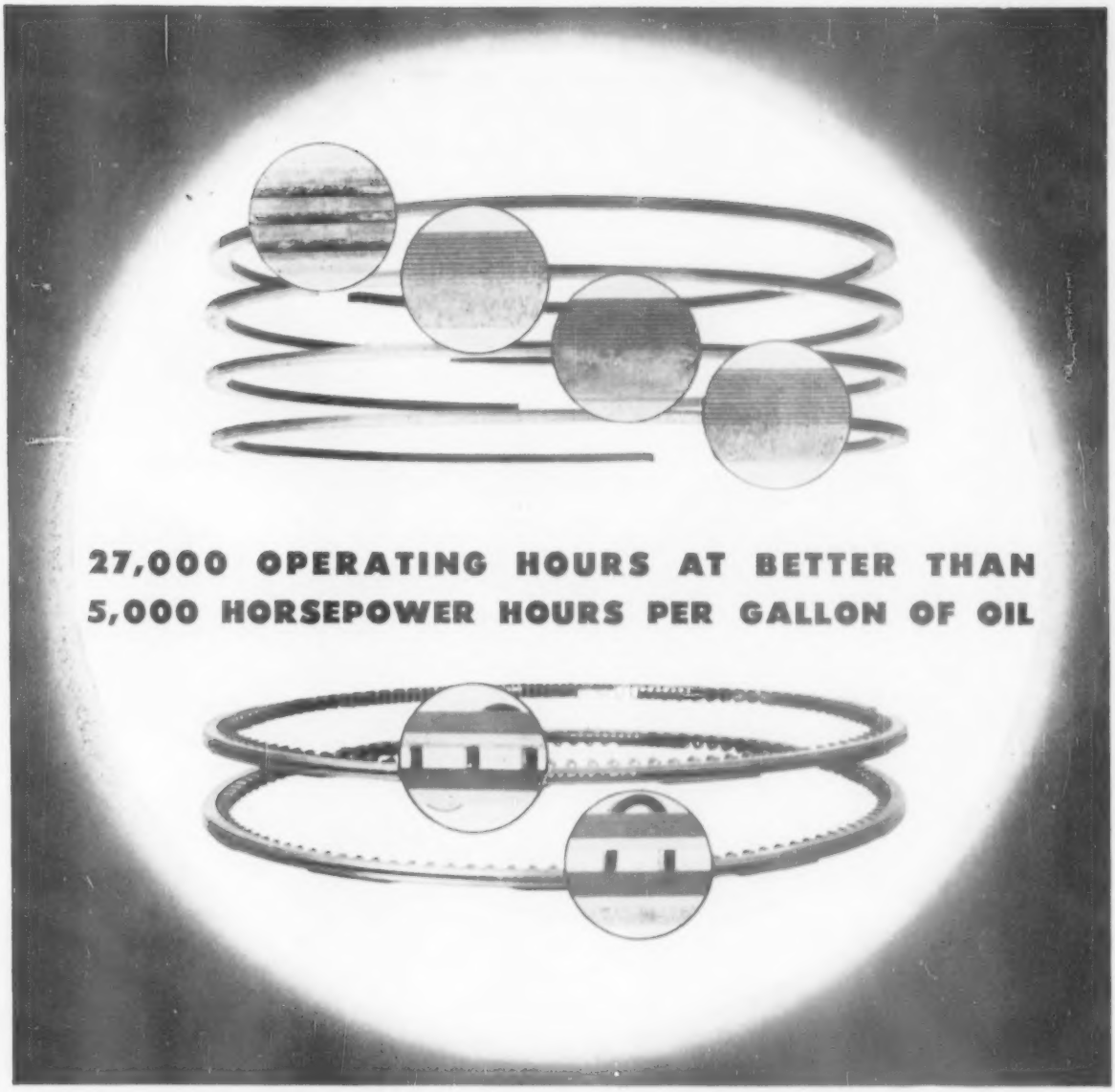
In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde Trade-Mark



27,000 OPERATING HOURS AT BETTER THAN 5,000 HORSEPOWER HOURS PER GALLON OF OIL

ENGINEERED RING SETS IS A PEDRICK FIRST

In 1921, the first complete set of rings in a single package, engineered for a particular internal-combustion engine, was introduced *by Pedrick*. You get 35 years of experience and know-how, therefore, in the complete sets we engineer for diesel and gas engines.

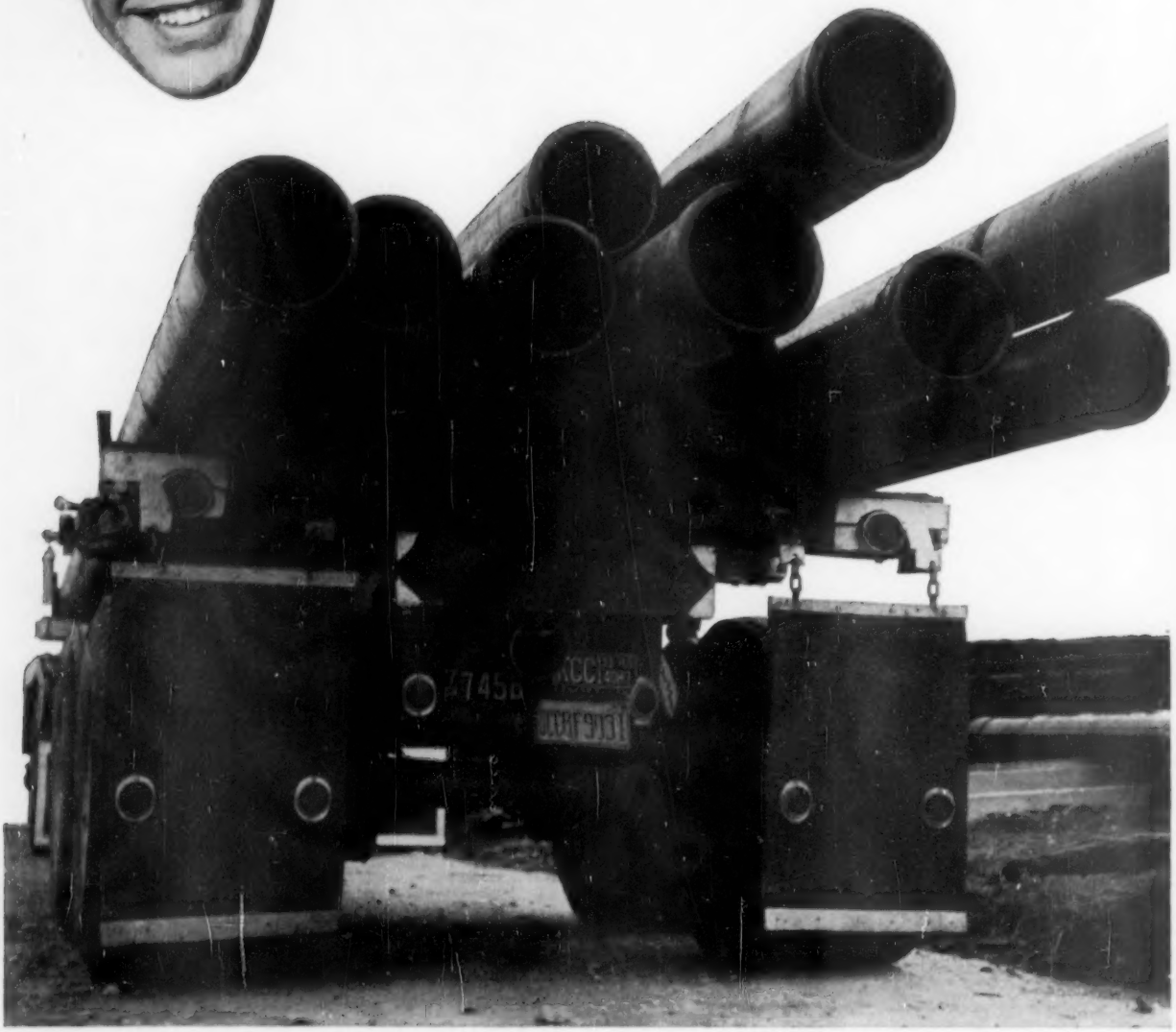
That's part of the reason Pedrick Engineered Sets give the kind of performance revealed by the un-retouched photo above. These rings are from a Pedrick E3902 Set taken out of a Cooper-Bessemer GMV engine after 27,109 hours of operation. Oil consumption averaged better than 5,000 hp. hrs. per gal. Wear in the cylinders was almost insignificant—averaging only .00725 in. at the top and .0035 in. at the bottom. Ring tension remains at practically original production level. Each ring shows face-wear only about halfway up, so rings still are practically as good as *new!*

For *your* engine's own good, use Pedrick Engineered Sets with the latest ring designs in proper combination, illustrated installation instructions, a single package per cylinder. You'll also enjoy the benefits of simplicity in ordering and stocking. The same engineering know-how which goes into Pedrick Engineered Sets is available to help you with special problems. Write, wire or phone: WILKENING MANUFACTURING CO., Philadelphia 42, Pa. SAratoga 9-3770. In Canada: Toronto 2.

Pedrick HEAT-SHAPED **PISTON RINGS**

PEDRICK PRECISIONEERING KEEPS PEDRICK FIRST

GET FAST SERVICE



REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

ON CASING AND TUBING

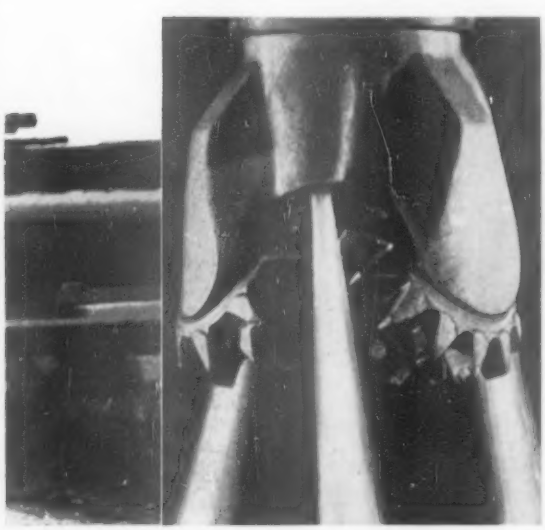
Call your Republic Oil Country Distributor. He is an independent business man. His well-being depends on furnishing you top-quality materials wherever you need them. And he's a specialist at doing just that . . . fast.

When you order Republic Electric Weld or Seamless Casing and Tubing from him, his service will speak for itself. Then after you experience how easy these products are to run and how dependably they perform, you'll see why you save both time and trouble by specifying Republic Casing and Tubing.

Ease of installation and dependability of these outstanding products stem directly from manufacturing know-how. In the case of Electric Weld Casing and Tubing we start with flat rolled steel of uniform width and thickness. Both sides are closely inspected to assure pipe of smooth surface, free from defects inside as well as outside. The steel is then cold formed and welded into a strong, concentric, ductile tube—normalized to secure uniform grain structure, and cold sized to assure high yield strength and true round cross section. Result: Uniform strength throughout to resist collapse—uniform thickness of metal in threaded ends to help avoid costly pullouts.

Republic Seamless Casing and Tubing is made to no less rigid specifications. Quality is built in by experienced craftsmen using the latest methods, machines and scientific controls, in the most modern seamless mill in the world.

So, whatever your casing and tubing needs, contact your Republic Oil Country Distributor. He carries Republic Electric Weld in grades H-40 and J-55, sizes 2⅜" through 13⅜" O.D.; and Republic Seamless in grades J-55 and N-80, sizes 2⅜" through 9⅝" O.D. Or mail coupon for further information.



QUICK DELIVERY OF SPINNING CHAIN is yours through your Republic Oil Country Distributor. Of special analysis alloy steel, Republic Spinning Chain is tough and resistant to shock and abrasion. You can get it in sizes ⅝ inch and ¾ inch x 14 feet through 33 feet. Republic Spinning Chain has been accepted by the Division of Industrial Safety of the State of California. Your Republic Distributor also carries Republic's high-quality boomer chain, winch line end chain, and truck and tractor tire chains.

DRILL BIT SERVICE LIFE is greatly increased, thanks to use of specially developed Republic Alloy Steels. Their toughness and ductility assure maximum resistance to impact and torsional stresses. Hardenability increases effective life against abrasive strata. Republic alloy steels are well suited to a wide variety of oil field equipment applications. Typical examples are tongs, blocks, draw works components.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C - 2106
3112 East 45th Street
Cleveland 27, Ohio

Please send additional information on:
☐ Casing and Tubing ☐ Chain Products ☐ Alloy Steels

Name_____ Title_____

Company_____

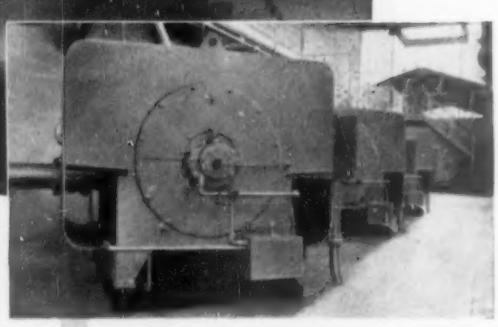
Address_____

City_____ Zone____ State_____

For Positive All-Weather Protection

Neither wind-driven rain nor sand could penetrate the baffled ventilating system of this Allis-Chalmers Weather-Protected Squirrel-Cage Motor.

ALLIS-CHALMERS Motors



Three 1250-hp, 2300-volt, 3580-rpm weather-protected squirrel-cage induction motors driving pumps for oil well flooding duty.

Here's what we mean by protection! The roughest tests we could devise — wind-driven water equal to a 40-inch-per-hour rainfall, sand at velocities reaching 75 mph — failed to penetrate the vital areas of this Allis-Chalmers weather-protected squirrel cage motor.

This tested and operation-proved design utilizes the same rugged construction features and engineering experience that make Allis-Chalmers motors the standard in the petroleum industry for performance and reliability.

Weather-protected motors are but part of the complete line of motors Allis-Chalmers builds for pipe line and refinery service. For more information, see your local A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

A-4908

Silco-Flex is an Allis-Chalmers trademark.

NOW, Even Greater Winding Protection with Revolutionary Silco-Flex

all-silicone-rubber motor insulation. Available on many of the larger size Allis-Chalmers motors. For further information, ask your Allis-Chalmers representative.

ALLIS-CHALMERS

WHERE CLEANLINESS

SAFETY and

ECONOMY COUNT...

Hospital corridors must be easy to clean and safe from fire. The answer here is wainscoting of K&M Apac.

K&M "APAC" ASBESTOS SHEETS

These two illustrations show but one of many excellent uses for this material . . . use K&M Apac almost anywhere . . . as interior and exterior siding, office paneling, plant and office ceilings, machine shop sheathing, stock room sidewalls, basement partitions, linings for elevator casings; as inside-plant enclosures, as waste and storage bins, and even as hoppers.

K&M Apac is the ideal low-cost, long-life building material. It is made of two practically indestructible ingredients . . . asbestos fiber and portland cement . . . and actually grows harder and more durable with age. K&M Apac cannot burn, rot or corrode, nor can it be damaged by vermin or rodents. Apac is easily sanitized with soap and water.

PRACTICALLY NO MAINTENANCE NEEDED, indoors or out! K&M Apac sheets are highly weather-resistant. Their natural gray color is attractive and no painting is required for protection.

INEXPENSIVE APPLICATION is possible with K&M Apac . . . large 4′ x 8′ sheets can be applied on a big area quickly, and even unskilled labor can cut, drill or shape them on the job without special equipment.

K&M Apac is ideal for this ramp-wall which must be rugged to withstand the continuous scuffing and scraping of heavy traffic.

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COMPANY • AMBLER • PENNSYLVANIA

K&M best in asbestos®

THIS 400,000 Pounds per HOUR

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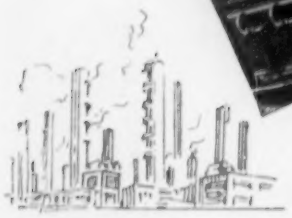
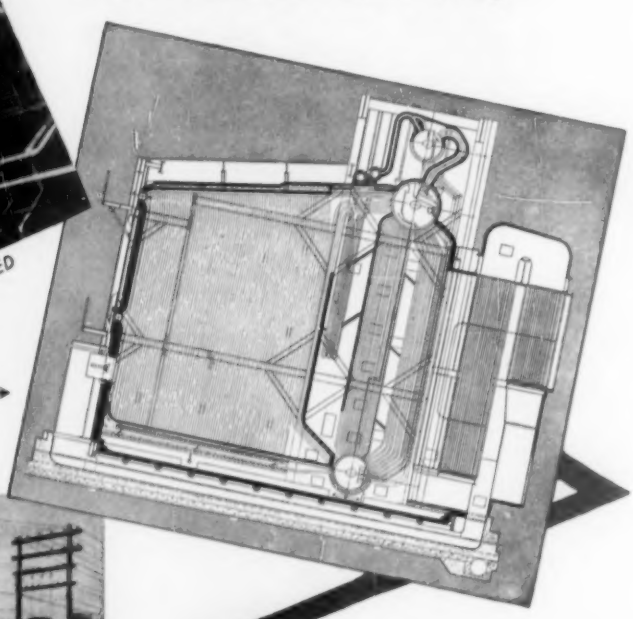
STEAM GENERATOR

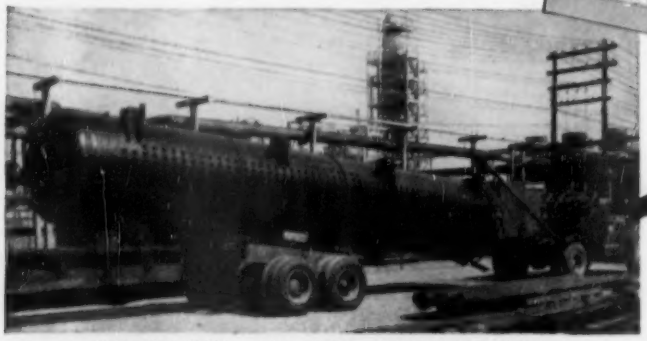
Gives Top Performance in a Leading Texas Petroleum Refinery

VIEW OF THE COMPLETED STEAM GENERATOR



RIGHT → LONGITUDINAL SECTION THROUGH THE UNIT.





6'-6" DIAMETER x 37'-0" LONG STEAM DRUM BEING TRANSPORTED TO THE ERECTION SITE DURING INSTALLATION.

PRINCIPAL DATA

400,000 pounds per hour capacity.

Fusion welded steam and water drums designed for 700 lbs. S.W.P.

Superheater delivers steam at 750°F. total temperature.

Water cooled furnace.

Burners for Oil and Acid Sludge fuel.

Vogt builds a complete line of bent tube steam generators designed to burn solid, liquid, or gaseous fuels to meet specific operating conditions. Write for bulletins.

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BRANCH OFFICES: New York, Philadelphia, Chicago, Cleveland, St. Louis, Dallas, Charleston, W. Va.

Get Higher Factor of Safety with New VHS Rotary Drilling Lines

• One of the many benefits drillers get with new VHS rotary drilling lines is higher factor of safety. For this new drilling line is 15% stronger than Improved Plow Steel—the strongest grade available before the introduction of VHS.

This means that 10 lines of VHS have a factor of safety 15% greater than 10 lines of the same diameter of IPS. Or, to put it another way, 10 lines of VHS have a factor of safety roughly equivalent to 12 lines of IPS.

TOUGHER, TOO!

New Lay-Set VHS is not only stronger, it's also tougher—and therefore it has higher resistance to peening, and greater resistance to abrasion. Both of these are important factors in maintaining shape and diameter. If regular adaptable cut-off practices are followed, ton-mile advantages should result.

CUT "DOWN TIME"

With new Lay-Set VHS you can drill deeper before increasing the number of parts of line. And VHS's extra strength eliminates, in many cases, any necessity for buying new blocks or regrooving sheaves to use larger diameter lines for higher safety factor.

SIMPLE TO ORDER

You don't need any complicated specifications to order new Lay-Set VHS drilling lines. Just call your Hazard Distributor and tell him the length and diameter you want. He probably has it in stock—or he can get it readily.

for further information write to the nearest Hazard office for Brochure **DH-522**

LAY-SET VHS

15% Stronger • Tougher •

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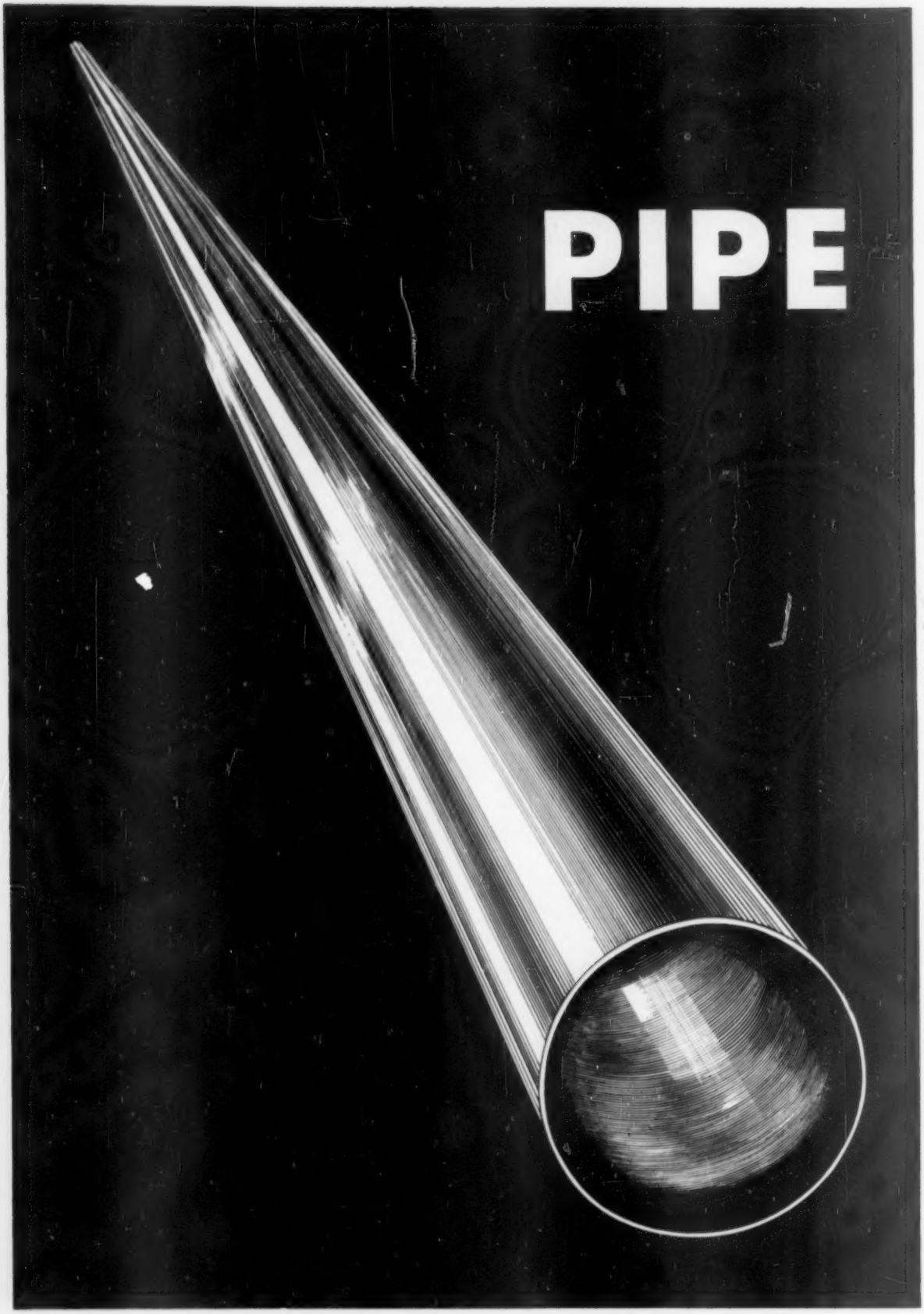
PIPE

FOR SALE

IN SIZES UP TO 10" DIAMETERS

Reynolds Oil Country Pipe—
for temporary oil, water and gas lines. Hundreds of miles now in service and saving up to 90% on installation costs. Available now from leading oil country distributors in your area.

Reynolds Process Piping—
most economical corrosion resistant piping for chemical plants, petroleum processing, food handling and other applications.

Gathering and Transmission Lines—
let Reynolds engineers show you the installation, maintenance and operating advantages of aluminum's light weight, resistance to corrosion, weldability and greater smoothness in gathering and transmission lines for water, crudes, gas and products.

Reynolds can supply aluminum pipe *now*.

We can ship pipe up to 10" sizes within thirty days from receipt of order. Many sizes are available in Reynolds Distributor Stocks throughout the country for immediate shipment.

This is seamless, extruded aluminum pipe. It has proved itself in rugged service. Its light weight gives you three or more times the footage per pound. Its freedom from rust and resistance to corrosion make it last far longer than traditional materials in many applications.

Reynolds staff engineers will assist you in making best use of aluminum pipe. For their help and complete information on aluminum pipe contact the Reynolds office nearest you.

Write, Wire or Call Reynolds Metals Company, P.O. Box 1800-CR, Louisville 1, Kentucky

REYNOLDS ALUMINUM

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

Change To . . .
PROTO-NUPLA
Soft-Face Hammers!

Case Histories Show up to $10,000 per Year Savings!

PROTO-Nupla hammers bring every possible saving to the soft-face hammer user. One material—*Nuplaflex*—ranges from "soft as flesh" to "hard as brass." Screw-in tips are quickly interchanged. Nuplaflex tips outlast other soft-face materials as much as 100 to 1.

Inventory and stock problems are simplified. You have less work damage, fewer lost man-hours, greater flexibility, easier training, greater safety. Send 10¢ for catalog of entire PROTO line to

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Nuplaflex Tips Are Available in 7 Grades of Hardness to Meet the Requirements of Every Soft-Face Hammer Job.

These Are Nuplaflex Advantages . . . Check Them!

All meet Federal Specs. • Recover shape when dented or cut • Will not flake • Non-sparking • Will not burn readily • Resistant to grease, oil, gasoline, and common industrial acids • Absorb sting-causing vibration • Safe for workmen's eyes—no flying particles • Reduce worker fatigue • Minimum rebound to permit faster work.

If You Are Not Getting These Nuplaflex Advantages . . . You're Losing Money!

336 different combinations, including 1½" and 2" shot-loaded impact types designed to reduce rebound. 12 different holders available—two weights for 1", 1½", 2", 2½", and 3" diameter faces.

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PROTO TOOLS
PROTO means PROfessional TOols

They Say—

Sunray Mid-Continent Pay Off

"Early in 1955 we told shareholders who approved the merger of Sunray and Mid-Continent in May of that year that the association of these two companies would be good for all. The success of the merged company to date has proved the merit of this decision from the employes' standpoint and the business and financial standpoint.

"It is now only proper, therefore, that Sunray Mid-Continent's stockholders share in this progress and the directors were unanimous in approving the (stock) distribution recommended by its officers . . .

"Although an excessive amount of imported oil continues to be an upsetting factor in the domestic refined products market, and U. S. producers greatly need a field price increase to at least partially regain ever-increasing discovery and production costs, Sunray Mid-Continent's first half earnings will be ahead of last year although preliminary accounting figures are not yet available. The company's second 6 months' performance and income will also be on the up side."

C. H. Wright, chairman of the board of directors, Sunray Mid-Continent Oil Co., in a report to the company's shareholders.

More Refinery News

Gentlemen:

Thank you very much for the excellent coverage which you have given to the paper which I presented at the mid-year refining session of the A.P.I. in Montreal last May. In your July 16th issue of The Oil and Gas Journal you have generously given four pages to my paper and have further given it the stimulating title of "Here's REAL Preventive Maintenance."

I believe that we in oil refinery maintenance are in need of some favorable publicity from time to time and in this respect it appears to me that you are certainly contributing your share of assistance.

C. C. Carmine,
Supervisor of maintenance and construction, Tidewater Oil Co.,
Avon refinery,
Associated, Calif.

(Editor's note: We certainly agree with reader-writer Carmine that maintenance is one of the most important refining subjects to be covered editorially. For other articles on refinery maintenance

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IMPROVED
to meet the demands of faster, deeper drilling!

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for producers and refiners

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Petreco electric dehydration is an automatically controlled method for reducing the B.S. and W. content of crude oil to pipe line specifications. It is particularly adaptable for large central plant dehydrating systems and also is highly effective on low gravity crudes.

PETRECO SEDIMENT SEPARATION

Where producers utilize sub-surface hydraulic production pumps, it is essential that the power oil be clean, dry and free from fines, sediment, etc. Petreco Electric Sediment Separation removes such impurities from crude oil and delivers clean power oil.

PETRECO ELECTRIC DESALTING

Petreco pioneered electric desalting and is the recognized leader in this field. Petreco offers a choice of desalting vessels, to better handle varying volumes of crude. In every refinery where Petreco desalters have been installed, salt difficulties have been stopped.

PETRECO ELECTROFINING

Electrofining is a Petreco development and offers a revolutionary method for caustic washing, acid contacting, doctor treating and nitrogen base removal. Electrofining usually is a single-unit, one-pass, automatically controlled, continuous process.

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The Petreco Bender Process is utilized for sweetening gasoline, kerosine, jet fuel and No. 2 fuel. Sweetening is effected by converting mercaptans to disulphide by oxidation. The chemical cost is low, throughput rates are high, and catalyst can be rejuvenated at the plant.

PETRECO ELECTRIC LUBE-OIL TREATING

Petreco Lube Oil Treating provides continuous, automatically controlled acid treatment for lube oils and similar stocks. Treating takes place in a closed system, requiring much less tankage than conventional acid treaters. It saves acid, time, space and guesswork.

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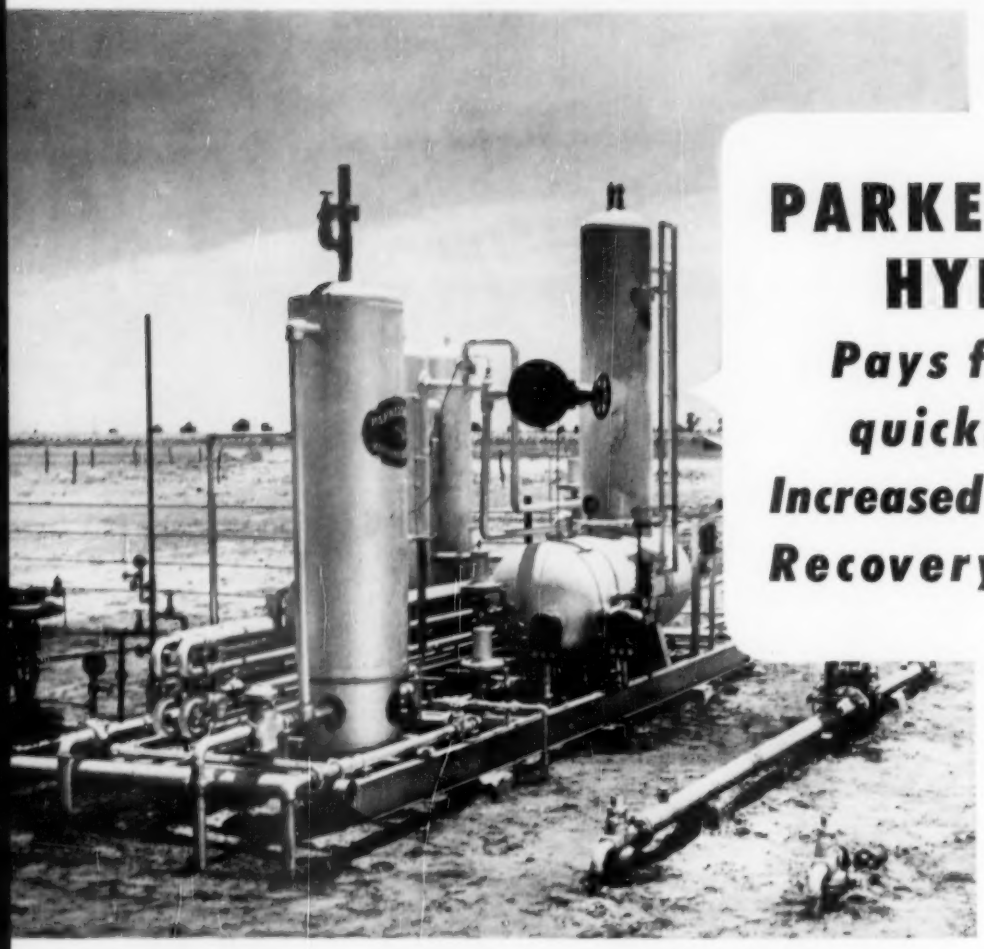

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Pays for itself quickly from Increased Condensate Recovery Revenue

For profit-producing performance, a Parkersburg Hyreco has no peer. "Tailor-made" to fit your specific well conditions, it increases condensate recovery . . . substantially boosts revenue from gas wells . . . brings operating costs way down by its consistent trouble-free operation. No other unit can process high pressure gas at such low temperatures with less freezing trouble . . . no other unit pays for itself so quickly.

The Parkersburg Hyreco is available in capacities from 5 to 20 MMCF/D; pressures from 2000 to 6000 psi with either single tube or twin tube vertical knockout for liquid or water removal.

When you are ready for a processing unit it would more than pay you to discuss an "individualized" Hyreco with your Parkersburg Representative.

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in the Journal this year refer to these issues: January 9, page 115; March 19, page 120; March 26, page 117; April 9, page 86; April 23, page 103; May 14, page 164; July 2, page 90; and July 23, page 76.)

Shrewd Management Needed

"The truth is this: We have been riding high on a small investment of management ingenuity. There are very few hands at the helm today that have weathered financial storms of a depression intensity. Few indeed have been tested by a year of sustained adversity. It is a bit of a challenge to meet a tough competitive situation, and it is good exercise for management muscles to feel a bit of strain when expenses are rising and sales are tapering off."

July issue of Dun's Review and Modern Industry.

Tribute to "Mike" Irelan

"If Mike Irelan (S. B. Irelan, late president of Cities Service Oil Co.) were writing this, he probably would exhort all of us to greater effort, remind us of our obligation to the public we serve, stimulate our loyalty to our company, warm our hearts with words of friendship, and close with a rousing phrase eulogizing his beloved petroleum industry.

"His death on June 18 brought to a close a life of vitality and enthusiasm, a life devoted to the Cities Service organization . . .

"If Mike's associates were willing to use their abilities and make recommendations and decisions at the risk of making big mistakes, they were on his team. In his own humorous and inimitable way, he would say: 'You do the job and I'll stand behind you 'till they beat you black and blue.'

"We will miss Mike Irelan."

Editorial by Glenn W. Clark, president, Cities Service Gas Co., July issue of Dispatcher, Cities Service Gas publication.

CALENDAR

AUGUST

10 Southern Gas Association, compressor station operations round-table conference, Mayo Hotel, Tulsa.

17 Southern Gas Association, pipeline operations and maintenance round-table conference, Hilton Hotel, El Paso, Tex.

20-21 North Dakota Oil and Gas Association, annual meeting, Bismarck, N. D.

23-25 Alberta Society of Petroleum Geologists, sixth annual field conference, Canmore-Kananaskis region, Alberta.

27-29 Sixteenth Annual Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

SEPTEMBER

5-7 Wyoming Geological Association, eleventh annual field conference, Jackson Lake Lodge, Moran, Wyo.

7-8 Association of Desk and Derrick Clubs of North America, annual convention, Roosevelt Hotel, New Orleans.

9-12 American Institute of Chemical Engineers, William Penn Hotel, Pittsburgh.

9-12 Independent Natural Gas Association of America, annual membership meeting, St. Anthony Hotel, San Antonio, Tex.

11-13 Pacific Coast Gas Association, annual meeting, Hotel del Coronado, Coronado, Calif.

12-14 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

16-18 New Mexico Petroleum Industries Committee, annual convention, Hilton Hotel, Albuquerque.

16-21 American Chemical Society, 130th annual meeting, Atlantic City, N. J.

16-21 American Society for Testing Materials, second Pacific area national meeting, Statler Hotel, Los Angeles.

17-21 Instrument Society of America, eleventh annual international instrument-automation conference and exhibit, New Coliseum, New York.

19-21 Southeastern Gas Association, Hotel Sir Walter, Raleigh, N. C.

20-21 Western Petroleum Refiners Associa-

JOB WANTED

Night and day watchman. Always alert, never sleeps. Will watch over your engines at all times, let you know immediately when lubricating oil pressure drops too low or cooling water overheats. Then you can correct the trouble before it becomes critical. Will warn you in one of three ways—sound an alarm, flash a warning light or shut down the engine. Finest references: have proven record of success on thousands of engines. Will guard your engines just as faithfully. My name: Penn engine safety control. No salary required—just a few dollars at the very beginning will cover everything.

And, I will perform my duties equally well with your present engines or with new equipment direct from the manufacturer. Get my complete story from your jobber.

PENN CONTROLS, INC. Goshen, Indiana

AUTOMATIC CONTROLS FOR HEATING, REFRIGERATION, AIR CONDITIONING, GAS APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

tion, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

20-21 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual membership meeting, Roosevelt Hotel, New Orleans.

20-22 Oklahoma City Geological Society, field conference, Guymon, Okla.

24-26 American Society of Mechanical Engineers, petroleum mechanical engineering conference, annual meeting, Statler-Hilton Hotel, Dallas.

26-28 Rocky Mountain Mineral conference, American Institute of Mining, Metallurgical & Petroleum Engineers, Newhouse Hotel, Salt Lake City.

28 Natural Gasoline Association of America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

OCTOBER

2-3 Texas Mid-Continent Oil and Gas Association, thirty-seventh annual meeting, Rice Hotel, Houston.

7-9 American Association of Oil Well Drilling Contractors, annual meeting, Texas Hotel, Fort Worth.

9-10 Southwest Kansas Petroleum Industry and University of Kansas, fourth annual two-day gas measurement institute, Liberal, Kan.

10-12 International Geological Symposium of the Williston Basin, Bismarck, N. D.

11-12 California Natural Gasoline Association, fall meeting, Sheraton Huntington Hotel, Pasadena, Calif.

14-17 American Institute of Mining, Metallurgical & Petroleum Engineers, Petroleum Branch, fall meeting, Biltmore Hotel, Los Angeles.

14-20 OIL PROGRESS WEEK.

15-17 American Gas Association, annual meeting, Atlantic City, N. J.

18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

18-21 Permian Basin Oil Show, Odessa, Tex.

22-24 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

23-26 National Association of Corrosion Engineers, south central region, Beaumont, Tex.

26 Natural Gasoline Association of America, southern regional meeting, Captain Shreve and Washington-Youree Hotels, Shreveport.

26 American Institute of Chemical Engineers, South Texas Section, eleventh annual technical meeting, Galvez Hotel, Galveston, Tex.

29-30 Illinois Geological Survey, Petroleum Engineering Conference on Waterflooding, University of Illinois, Urbana, Ill.

29-30 Independent Petroleum Association of America, twenty-seventh annual meeting, Statler-Hilton Hotel, Dallas.

29-Nov. 1 Society of Exploration Geophysicists, annual meeting, Roosevelt Hotel, New Orleans.

31-Nov. 2 Gulf Coast Association of Geological Societies, sixth annual convention, Plaza Hotel, San Antonio.

NOVEMBER

1-2 Louisiana Polytechnic Institute, fifth annual instrumentation conference, Ruston, La.

7-8 Instrument Society of America, Philadelphia Section, symposium on process data logging, Stratford Hotel, Philadelphia.

8-9 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Pacific Coast Joint Regional Meeting, Ambassador Hotel, Los Angeles.

8-9 Society of Automotive Engineers, Inc., national fuel and lubricants meeting, Mayo Hotel, Tulsa.

12-15 American Petroleum Institute, thirty-sixth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

19-20 American Institute of Mining, Metallurgical & Petroleum Engineers, North Texas Secondary Recovery Symposium, Municipal Auditorium, Wichita Falls.

25-30 American Society of Mechanical Engineers, Statler Hotel, New York.

30 Natural Gasoline Association of America, Panhandle-Plains regional meeting, Herring Hotel, Amarillo, Tex.

DECEMBER

9-12 American Institute of Chemical Engineers, annual meeting, Statler Hotel, Boston.

1957

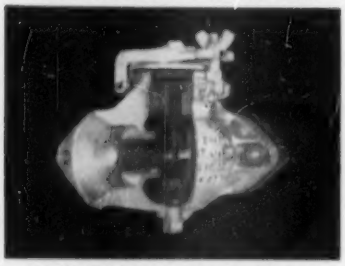
JANUARY

14-16 Pipe Line Contractors Association, ninth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

FEBRUARY

22 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

Enardo 1900 Series In-Line Vent Valve



Enardo 800 Series In-Line Vent Valve

Are you still looking in the sky for profit losses? Enardo Vent Valves provide a means of keeping a predetermined pressure on stock tanks. These vent valves are used in conjunction with Enardo pressure type hatches. Set 2 to 4 ounces less than hatch pressure to prevent hatch venting.

On leases not using a positive venting system, that have changed to an Enardo Vapor Control System, it has been proven that there was an immediate increase in saleable fluid gravity. For, on a lease with a production of 50 barrels per day, it is possible to add a total savings of $1,482.00 in the books after the installation of proper hatches and vent valves, cutting gravity and volume loss.

Enardo 800 series Vent Valves are offerred in standard 2", 3" and 4" pipe sizes, pressure settings ½ to 16 ounces. Featuring aluminum or semi-steel bodies with plastic trim. Slip-On or flanged ends. Standard valve is 1 ounce pressure, 4/10 ounce vacuum.

Enardo 1900 series Vent Valves also offered in 2", 3" and 4" sizes, with or without companion flanges bolted on. Standard valve 2 ounce pressure, 4/10 ounce vacuum. Pressure settings from 2 to 24 ounces.

Contact the representative nearest you for further information.

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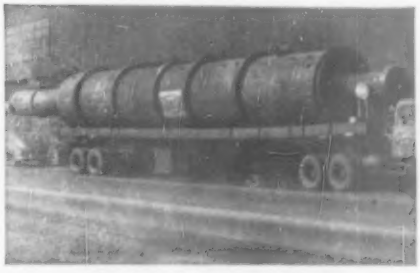

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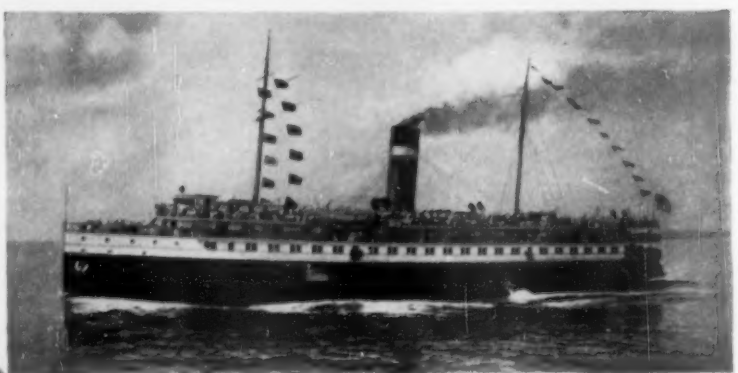
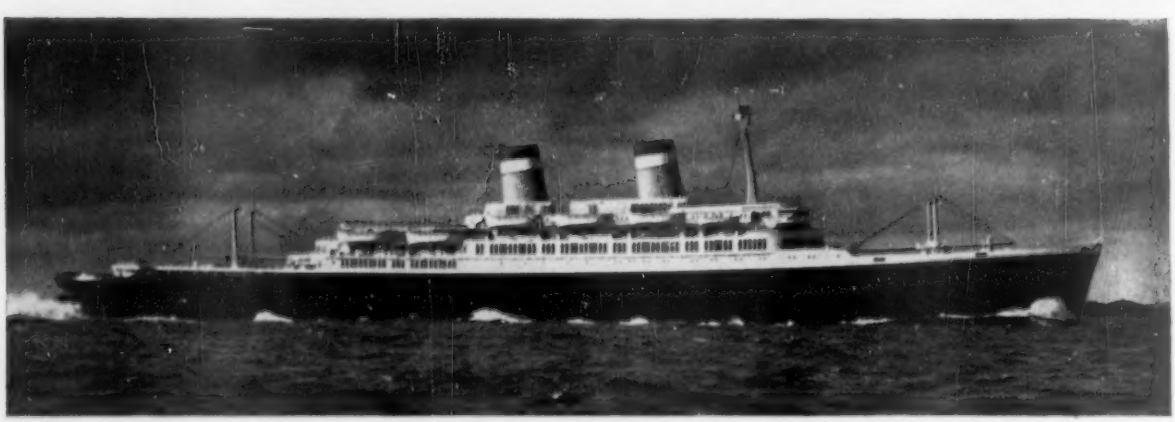
MARINE TURBINES

Turbines for the *S.S. Governor Cobb*, at right, first commercial ship in the United States to employ this form of propulsion, were built in 1906 by what is now Bethlehem's Hoboken Yard. For 41 years, until she was scrapped, the original turbines propelled this vessel through a varied career, including service as a U. S. Coast Guard helicopter carrier.



50 YEARS

of Marine Turbine Building



Turbines for the Bethlehem-built-and-engined *S.S. Independence*, above, and her sister-ship, *S.S. Constitution*, are lineal descendants of the *Governor Cobb's* engines and incorporate the accumulated research and experience of almost half a century. Thus, they may be expected to have a similarly long and dependable life.

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

The Hooper Dadoscope

WE'LL let you in on a little inner-office secret. Within our editorial staff there's a perpetual running feud between the boys with journalistic background and those with an engineering education. It's about 90 per cent kidding, but about 10 per cent real.

The writers are always trying to get the engineers to forget some of their technical jargon and write their stuff in plain English so it will read like a news story. And the engineers keep complaining that technical subjects have to be written in technical language and that the dimwits in the news department get everything balled up when they try to simplify an engineering article.

Well, one deadline day when the news department was at its highest pitch of hectic activity trying to get the book to bed, one of our most sober-sided engineer-writers rushed in breathlessly and announced that he had a hot scoop, a "must" for the next issue. Our harried news editor groaned, and tossed the story to a rewrite man to edit. With pencil poised in mid-air, the desk man read:

"TULSA. — A new research tool which will enable petroleum engineers to work many complicated problems by means of electronic computers has just been developed by a joint research project conducted cooperatively by a group of major oil companies.

"The machine, known as a turbo-encabulator, involves entirely new principles in electronic computers. For several years engineers have felt that if these principles could be incorporated into a calculator they could be applied to such intricate problems as reservoir analysis, field repressuring, design of pressure vessels, pipeline flow, and refinery operation.

"The breakthrough in the research came when a method was found for energy induction by the model interaction of magneto-reluctance and capacitive directance. A pilot-size model which has given excellent results in the Tulsa experiments consists essentially of a baseplate of prefabricated amulite, surmounted by a malleable logarithmic casing in such a way that the two spurving bearings are in direct line with the pentametric fan.

"The latter consists simply of six hydrocoptic marzel vanes, so fitted to the ambifacient lunar waneshaft that side-fumbling is effectively prevented. The main winding is of the normal lotus-o-delta type, placed in panendormic semibloid slots in the stator. Every seventh conductor is connected by a nonreversible tremie pipe to differential gridsprings on the ulterior termini of the grammeters.

"A revolutionary feature of the new turbo-encabulator is the spacing of the reminative grouting brushes with relation to the bitugenous spandrels so as to give a high annular grillage coefficient and a low h.f. rempeak. This was achieved by modulating the barescent skor motion to the periodicity of the sinusoidal depleneration.

"The present model still uses a conventional transcendental hooper dadoscope, but further experiments will be conducted by nubbing together a regurgitative purwell and supramitive wennel-sprocket, provided a sufficiently robust spiral decommutator can be devised to absorb the quasipiestic stresses in the gremlin studs of the roffit bars and prevent wending of the fromaging spanshaft."

Maybe it was the hooper dadoscope that did it, or maybe he got clear down to the gremlin studs, but anyway the ex-newsman finally tumbled to the fact that his leg was being pulled. He collared the culprit and forced him to admit that he had adapted the hoax from something he had picked up in his serious engineering studies.

So the engineering department is one up on the news department—temporarily—and the feud continues.

Seriously though, the "feud" is all to the good. In the continuous haggling and give-and-take over the best ways to present a technical subject, the engineers pick up some of the journalists' sense of news values and easy-reading style, and the writers absorb some of the engineers' technical knowledge and vocabulary.

The outcome, we feel, is a happy blend of easily read but factually correct material. Though neither group would admit to any contamination from association with the other, the process makes semi-journalists out of the engineers and semi-engineers out of the journalists.

The results of this teamwork can be seen all through every issue of the Big Yellow Book.

—*Henry D. Ralph.*

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Why crude prices should be flexible

WHY should the price of crude oil go up all at once and by the same amount all over the Mid-Continent and Southwest? That's the question Congress and the public ask every time there's a general increase.

There hasn't been a general increase for 3 years, and none seems imminent. But if and when one does come there will be a general outcry and a threat of congressional investigation to find out why.

The only answer is that that's the way it's always been. Most crude prices historically have been tied in with the Oklahoma gravity scale, and move up or down together. Hardly any crude price could change without affecting the general level. And when the general level changed it was an event of national import.

A NEW SYSTEM may be in the making right now. At least the way is being paved by the recent flurry of local price adjustments in various areas. Refiners are moving away from the rigidities of the old pricing method.

It's no longer true that "crude is crude," and that gravity is its chief measure of value. Today a refiner recognizes many types of crude, and evaluates each on several factors which may have little or nothing to do with its gravity.

We may see, in the not distant future, a multiplicity of price scales for different types of crude. These could move up and down independently of each other, reflecting differences in processing costs and yields at the principal refineries using each crude.

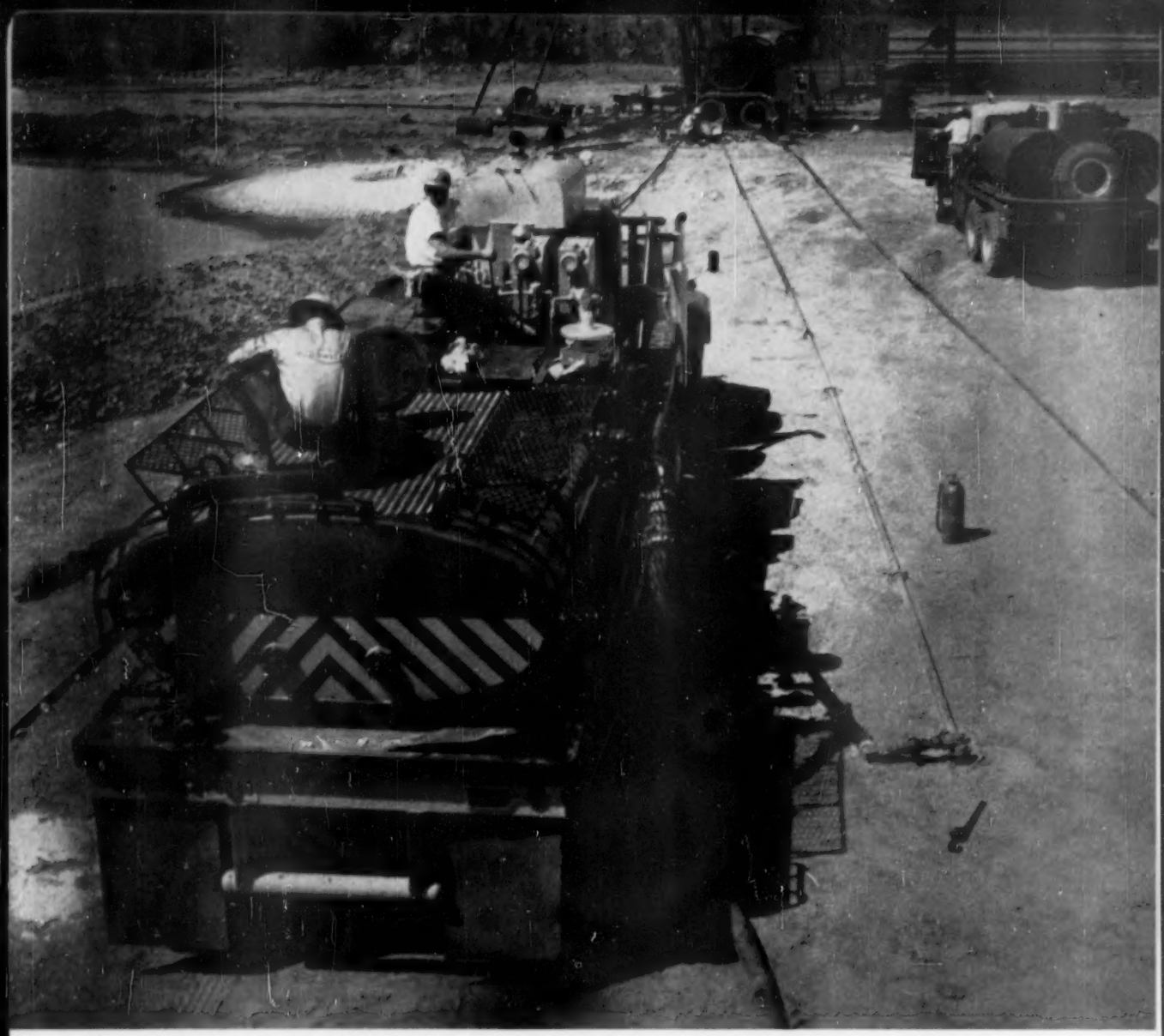
This would be healthy. It would stimulate buying competition among refineries, and give choice crudes the higher differential to which they are entitled. The old rigid scale overprices some crudes and underprices others—regardless of the general level of all crude prices.

Producers are alarmed because most recent local adjustments seem to be downward. This can be attributed to the overabundant supply of almost every type of crude. But in times when crude supply is a bit tighter in relation to demand the trend would be upward, with increases spotted here and there all over the map and over a period of months.

A BIG ADVANTAGE of such flexibility would lie in the political and public-relations effect. There would be no scare headlines that the "oil monopoly" had boosted crude prices everywhere overnight.

Like most other prices, crude prices would move upward gradually—a little here, a little there, and then some more later on—until the general average was brought up by over-all demand.

Not every area and type of crude would get the same increase at the same time, but there is no economic reason why it should. More flexibility in the crude-pricing system would help break the "freeze" that has been a factor in holding all crude prices rigid for the past 3 years.



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Silicates won't block production here

SILICATE CONTROL ACID is a Dowell development for improving acidizing effectiveness.

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For more information or service, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write to Dowell Incorporated, Tulsa 1, Oklahoma, Dept. H-11.

services for the oil industry

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Current and significant in . . .

The Industry This Week

Exploration

• **Arizona will have its second oil or gas field** and its third producer at El Paso Natural's Bita Peak wildcat in the state's northeast corner. P. 53.

Rumors of oil shows encountered in rank wildcats are sparking new interest in oil activities in Dhofar, Oman, and Libya. P. 71.

Refining

• **A possible buyer for U.O.P.** has been made public. It's Filtrol Corp., Los Angeles, maker of acid-activated adsorbents and catalysts. P. 53.

Management in the refining industry soon may face union demands for 36-hour week. Issue is due to come up for action at O.C.A.W.'s convention later this month. P. 66.

Another refiner—Wilcox Oil Co.—has bowed to octane race. Wilcox is closing its small Bristow, Okla., plant. D-X Sunray will supply its marketing operations. P. 62.

Production

• **Foreign crude production is rising** higher while U. S. output slips for the second straight month. Foreign free-world production for May hit a record 7,797,200 bbl. daily. U. S. dropped to 7,064,000 bbl. P. 70.

Alberta must produce 447,711 bbl. daily in August to meet a record demand caused by end of strike at Shell's Anacortes plant. P. 62.

Texas Railroad Commission is making pressure-maintenance projects more attractive to producers with increased allowables. P. 66. Agency has given green light to two projects which will net 16.3 million barrels. P. 52.

Special injection mixture of propane and separator gas is being planned by Humble in proposed secondary-recovery project in huge Seeligson field in South Texas. P. 60.

Industry

• **Oil has biggest stake in Suez Canal crisis.** It has company planners mapping their strategy for two possible results: Substantial increase in canal tolls or complete shutdown of the vital waterway. P. 50.

Oil men are just beginning to count the cost of the steel strike, whose aftermath will be felt for another year. It has taken a toll of 200 rigs idled, 2,000 wells cut from last-half programs, upped costs sharply, and assured a continued steel shortage for the foreseeable future. P. 56.

Jersey Standard is moving into another Midwest market. It is completing a deal for South Side Petroleum and affiliated Oklahoma Oil Products in Chicago area. Completed earlier was deal for Pate Oil in Milwaukee. P. 59.

Powerful support in U. S. Senate is being picked up by domestic producers in their fight to limit rising flow of foreign crude. P. 54.

The 7-cent price cut on West Central Texas sweet crude apparently has become general. Humble and Shell also have reduced postings. P. 59.

Drilling

• **Latest offshore innovation:** a "mud refueling" service which delivers 1,000 tons of dry mud in bulk form in a single trip to an offshore rig. P. 62.

Russian engineers claim they get increased penetration rates by "multi-bore" drilling from same derrick in mountainous and offshore areas. P. 72.

1955 Canal Shipments

(Barrels daily)

FROM:	
Kuwait*	845,000
Saudi Arabia	192,000
Iran	99,570
Iraq	80,550
Qatar	80,835
Bahrain†	40,165

TO:	
United Kingdom	417,100
France	246,320
United States	175,200
Italy	149,000
Netherlands	147,800

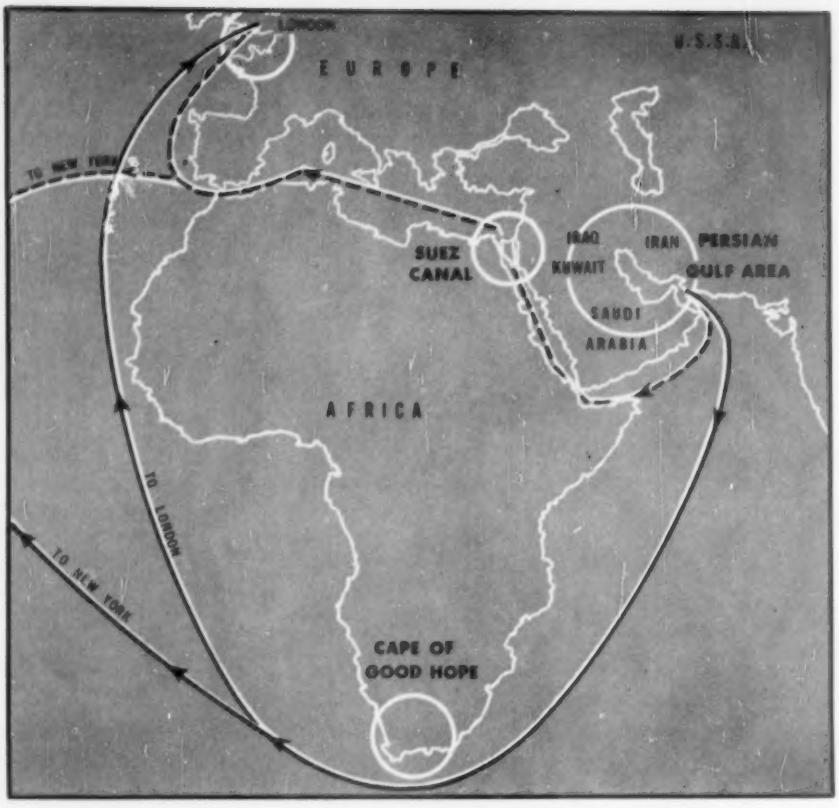
*Includes 10,200 bbl. daily from Neutral Zone. †Includes some products.

Tanker Distances

(Nautical miles from Ras Tanura)

VIA SUEZ TO:	
Southampton	6,220
New York	8,290

VIA CAPE TO:	
Southampton	10,955
New York	11,815



What the Suez Crisis Means to Oil

BIGGEST stake in the diplomatic poker game currently being played over the Suez Canal is oil. And the Middle East crisis has oil men the world over examining their hole cards.

The present maneuvering between Egypt's Gamal Abdel Nasser and the West may have two results:

. . . **A substantial increase** in canal tolls.

. . . **Or a complete shutdown** of international traffic over the vital waterway.

Either event would have sweeping economic repercussions on the world's oil industry. Added Suez tolls would mean a more expensive Middle East crude for European—and some American—refineries.

But a shutdown would:

. . . **Divert the flow** of 1,565,000 bbl. daily of crude which now is carried through the canal to the West.

. . . **Force shippers** to carry the oil around the Cape of Good Hope or build more pipeline capacity from the Middle East to the Mediterranean. This would be expensive and also time-consuming because the added shipping or pipelines needed can't be built in a day.

. . . **Increase fuel and raw material costs** to European industries competing for world markets.

. . . **Have a double-edged effect** in the United States. The advantage of American refiners operating on the cheaper Middle East crude would be lessened but domestic oil producers might find some relief from competition of cheap imports.

What's next? . . . Few western diplomats believe Nasser actually will close down the canal.

They think it's a remote possibility only if he feels forced to act to combat economic moves imposed on Egypt last week by Britain, France, and the United States. These blows "froze" Egyptian assets in retaliation for Nasser's sudden nationalization of the canal. Nasser seized the canal after Britain and the United States refused to help finance construction of Egypt's proposed Aswan dam.

Diplomats think Nasser will threaten to shut down the canal or increase its tolls in an effort to obtain concessions from the western powers. They also point out Nasser may run into trouble in his own backyard in operating the canal or attempting to shut it down. They see:

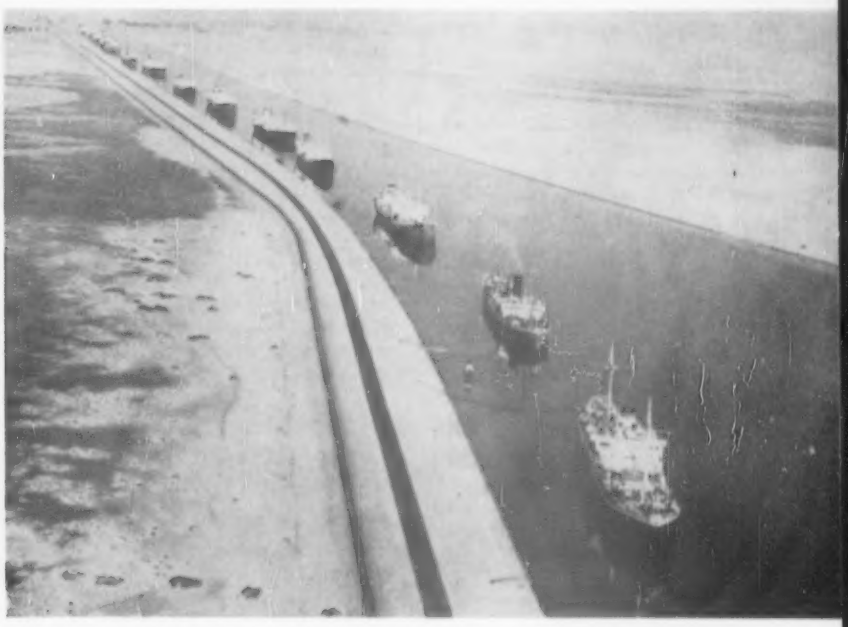
. . . **A revolt** among Arab nations. Nasser likely would meet opposition from the oil-producing Arab countries which the Egyptian colonel professes to lead. It is unlikely they will favor any move that will halt flow of their oil to market—and the returning flow of royalties.

. . . **Operating trouble.** Nasser can't keep his foreign employes working at the canal indefinitely even though he has now forbidden anyone to quit. A high percentage of his 215 canal pilots are nationals of other countries and they can't be replaced quickly.

Suez pilots are vital to operation of the canal. They are the most highly trained in the world. It takes more than 2 years training to become a canal pilot. Each must be familiar with nautical terms in 13 languages.

Also Nasser couldn't make the needed improvements in the canal to widen and deepen it to accommodate larger tankers now coming on the oil-shipping scene. Egypt just doesn't have the $50 million required for that job.

NEXT MOVE is pondered by Egypt's Gamal Abdel Nasser, shown relaxing at his retreat near Alexandria.



HEAVY SUEZ TRAFFIC emphasizes importance of vital 103-mile waterway seized last week by Egypt. Between 50 and 55 ships travel the canal in a single day. Ships shown above were tied up in traffic jam in January 1955 when canal was blocked after a ship hit a bridge.

Shippers' dilemma . . . While western diplomats confer in London over the Suez threat, Egyptian officials insist that canal traffic is perfectly normal.

But tanker operators—both private and oil company-owned—are disturbed. Some already are considering making the long haul around the Cape to avoid what they feel will be an almost endless series of trouble at the canal.

The present trend to mammoth tankers may speed up a move to bypass the canal. Some big tankers of the 32,000-ton class now are going through Suez short loaded—as much as 25,000 bbl. under capacity. Others, along with the supertankers of 40,000 tons and over, are going around the Cape.

Some shippers figure the big ships loaded to capacity take only about 9 days longer on the Persian Gulf-New York run around the Cape. But they save $20,000 in tolls and with the larger pay load can come out ahead.

Since January 1, six tankers have been completed in the 32,000-ton and over class. There are 13 supertankers now building ranging from 45,000 to 83,000 tons. The first 83,000-ton tanker will be delivered this month.

But the large tankers comprise only a small part of shipping tonnage involved. Problems will arise if the smaller ships are forced around the Cape.

This will require from 30 to 40 per cent more tanker tonnage to move the same volume of oil. The Cape haul also will add 60 per cent more to the cost of the trip to London and 30 per cent more to a New York trip.

The New York-Ras Tanura run is a 11,815-mile trip around the Cape. It is only 8,290 miles by the canal. A loaded T-2 tanker traveling at 15 knots needs 66 days to make the round trip by the Cape. It can make the same trip through the canal in 48 days.

The Suez Canal Co. says this 18 days less of sailing time via the canal means a saving of about $46,000 a trip for the tanker operator. This includes paying the $2,400 toll for the empty north-south trip through the canal and $5,200 in tolls coming back loaded.

The London-Ras Tanura trip is 6,220 miles through the canal, and 10,955 miles around the Cape of Good Hope. The haul to Rotterdam is 6,605 miles through the canal and 11,330 around the Cape.

The mileage savings thus are greater for western European ports than for U. S. The canal cuts 4,735 miles from the Persian Gulf - London run, 4,725 from the run to Rotterdam, and 3,525 miles from ships destined for the New York Harbor area.

What canal means . . . Movement through the Suez Canal has jumped tremendously since World War II.

The shipping, however, has changed direction to a great extent since the postwar buildup of refining capacity east of Suez. Last year by far the heaviest traffic on the waterway was in oil. Most of it moved from south to north in the form of crude from the Middle East to western markets.

The northbound tonnage last year totaled 87,426,000 tons compared to only 20,082,000 tons moving southward. Of the northward total, 66,893,000 tons, or 64 per cent, was crude and products. That's more than an average of 1,355,000 bbl. daily.

Great Britain is by far the largest Suez customer. In 1955, Britain received an average of 417,000 bbl. daily through the canal. France with a daily average of more than 246,000 bbl. was the canal's second best customer. Tonnage destined for United States' ports averaged 175,000 bbl. daily. Italy and the Netherlands followed with 149,000 and 148,000 bbl. daily, respectively.

In addition to taking more of the oil moved through the canal than anyone else, Britain also furnished more of the ships that moved it. British vessels represented 28.3 per cent of the canal's tonnage, but her lead is dropping every year. Norway was second with 13.5 per cent and Liberia, with 12.1 per cent, was third. France supplied 8 per cent of the tonnage.

The United States ranked ninth on this basis, but this is not a realistic figure. It probably would rank second if all the American-owned vessels under the Liberian, Panamanian, and Hondu-

ran flags were classified as American bottoms.

Pipelines loom big . . . The threat to canal shipping in the past 2 weeks has markedly increased the importance of the two pipeline systems which move almost 900,000 bbl. daily of the Middle East's oil to Mediterranean ports.

Trans Arabian Pipeline Co., an associate company of Arabian American Oil Co., is now moving 325,000 bbl. daily of Saudi Arabian crude to sea ports which can be reached without using the canal. Tapline is in the process of adding additional pump stations to boost this daily throughput to 410,000 bbl. daily.

Tapline apparently has solved its problem with the nations its line crosses. Several months ago it offered a profit-sharing plan to Saudi Arabia, Jordan, Syria, and Lebanon. It stipulated that the participating countries would have to work out the shares each got. There has been no announcement of an agreement between the four, but all have accepted Tapline's proposition.

The pipeline system operated by Iraq Petroleum Co., Ltd., to the same Mediterranean area is still in trouble. I.P.C. reached a settlement with Syria calling for increased payments, but Lebanon is still threatening to tax the company unless it receives the same toll for crossing only a fraction as much territory.

I.P.C., too, has plans for expanding the system. But it is unlikely that this will be undertaken until the dispute with Lebanon is settled.

Between the pipeline system and the canal, nearly all of the 3,600,000 bbl. daily of oil produced in the Middle East is moved to market. A threat to any of the three carriers imperils a large part of the region's oil production and profits.

The play-by-play . . . Six days after the U.S. and Britain withdrew their offers to help Nasser build his pet Aswan dam project, the Egyptian strong man retaliated.

He announced Egypt was seizing the assets of the joint stock company which has operated the 103-mile-long waterway since it first was opened in 1869. The company's charter will expire in 1968 and Egypt was due to take over the canal at that time.

Nasser declared Egyptians would operate the canal and use the income to build the Aswan dam. He said Egypt would pay for the seized property if all the company's assets were surrendered. The canal represents about half the company's total assets. He warned that any foreign intervention might close the canal.

Britain and France quickly froze all assets of the canal company. Britain also froze all of Egypt's sterling balances—both governmental and private. This alone was a $580-million blow.

The U. S. "temporarily" froze all assets of the canal company and the Egyptian Government in this country. The U. S. action did not apply to private Egyptian capital in the United States. Egyptian assets in the U. S. total about $62 million, mostly in government funds.

Meanwhile, American, British, and French diplomats met in London to survey the crisis, and these other developments took shape:

. . . British shippers were instructed not to pay canal tolls to the newly formed Egyptian agency operating the canal. Banks in Paris and London were refusing checks for canal tolls made to the Egyptian agency.

. . . Naval units were alerted by the British and ordered held on a standby basis.

. . . France called for show of force against Egypt. The French blame the U. S. for the crisis because this country withdrew its offer to help build the Aswan dam. The French declared the U. S. must back such a show of force.

. . . "We would fight," said Nasser's chief political aide when asked for Egypt's reaction to any show of force from the West.

. . . U. S. tanker charterers eyed the longer shipping route around the Cape and called ship owners' attention to the "canal clause" in their contracts. It provides added compensation if ships are prevented from traveling the canal and must make the longer trip.

. . . International jurisdiction over the canal was demanded by Britain and France to insure unfettered traffic. With U. S. backing they hoped to rally the International Chamber of Shipping to pressure Nasser. This group is composed of the 16 major maritime nations which use the canal.

Firestone Expanding Again

LAKE CHARLES, La.—Firestone Tire & Rubber Co. is expanding its synthetic-rubber plant here to increase production capacity 27 per cent. The expansion program is scheduled to be completed about year's end.

When the project is finished, the Firestone plant will have a capacity nearly double the 99,600 long tons annually at which it was rated when Firestone purchased the facility from the Government in the spring of 1955. Firestone started its first expansion here soon after purchase of the plant.

The newly announced expansion will boost capacity by 40,000 tons annually to 190,000 tons.

Big Floods Get OK

• Additional oil totaling 16,300,000 bbl. expected from two Texas projects

AUSTIN.—Unitization and pressure-maintenance projects which will net more than 16,300,000 bbl. of added oil have the green light from the Texas Railroad Commission in North Midland Farms and Sandusky fields in Texas.

The North Midland Farms project is expected to boost recovery from the Grayburg pay by 12,300,000 bbl.—about $31,000,000 worth—at a cost of only $1,000,000 *(The Oil and Gas Journal, July 16, page 68).*

The unitized flood of Sandusky's Oil Creek sand will net an estimated $6,663,000 from an added recovery of about 4,020,000 bbl.

Both projects call for pheripheral floods.

The North Midland Farms unit takes in the entire field with 2,640 acres and 40 producing wells in Andrews County, West Texas. The unit will convert six wells around the perimeter to injection service and inject water from the shallow Santa Rosa formation into the Grayburg below the original oil-water contact.

Object of this flood is aimed to reverse a sharp pressure decline in which pressure plunged almost 800 psi. from the original 1,768 psi. in only 3 years.

Unit operator is Stanolind Oil & Gas Co. Other participants are Magnolia Petroleum Co., Southern Production Co., Sharples Oil Corp., Forest Oil Corp., Anderson-Prichard Oil Corp., and David and Inez G. Fasken.

Sandusky . . . The Sandusky unit, operated by The Texas Co., hopes to begin water injection in 2 to 5 months.

It will inject water through five wells around the field perimeter. Three of these will be drilled, the remaining two converted from production.

The project takes in the entire reservoir with 1,621 acres and 30 wells. Primary recovery was estimated by Texaco at 7,467,700 bbl., or roughly 39 per cent of that originally in place.

The injection plant will be able to supply up to 10,000 bbl. a day. Initial plans are to inject about 6,000 bbl. a day, which would be about 1.2 times the total fluid withdrawals.

Sandusky was taken off the statewide producing-day schedule in March 1954 and permitted only 13 producing days. The commission granted a unit request that the field go back on the state-wide list with approval of the pressure-maintenance plan.

Filtrol Bids for U.O.P.

Catalyst maker wants to set up sealed-bid procedures to dispose of A.C.S.-owned process design-engineering firm

ALBANY.—Filtrol Corp. of Los Angeles has entered the competition to buy all common stock of Universal Oil Products Co., held in trust for the American Chemical Society.

Filtrol, a maker of acid-activated adsorbents and catalysts, including those used in petroleum cracking, last week revealed its desire to purchase the company in a petition filed with the Supreme Court of New York. It's understood that several other inquiries have reached the trustee, Guaranty Trust Co. of New York, since it petitioned the court for permission to sell all or part of the U.O.P. stock.

A.C.S. wants to sell the stock of the process design and engineering firm to obtain a more diversified portfolio of securities which would provide a larger and more stable income for petroleum-industry research *(The Oil and Gas Journal, July 2, page 64)*.

Filtrol has been interested in U.O.P. for about 1½ years, according to a company source. When the trustee petitioned to sell the stock, Filtrol wrote J. Luther Cleveland, Guaranty's board chairman, stating the company's desire to submit a bid.

Antitrust angle . . . Filtrol said, however, that any deal will have one big "if."

It referred to investigations into U.O.P. operations by the antitrust division of the U. S. Department of Justice.

Filtrol asked that an orderly, objective, and impartial procedure be set up whereby interested parties would submit sealed bids. The trustee would accept the most advantageous offer.

Guaranty Trust agreed that anyone interested in buying U.O.P. should investigate its relations with the Justice Department and that such action would be suggested.

But the trustee added that it did not plan to set up any bidding procedure as asked by Filtrol. Anyone who wishes to make an offer may do so, Guaranty added, and all offers will be considered. It said that a large number of inquiries had been received, but until the court actually approves the sale, there is doubt that any specific offers will be made.

Filtrol proposal . . . Filtrol then countered with a petition filed with the New York Supreme Court.

It asked the court to set forth a formal bidding procedure to be followed by the trustee in making the sale of any or all of the U.O.P. securities. It would be along these lines:

. . . All bidders would put up $5,000,000 as evidence of good faith.

. . . All bids would be sealed.

. . . An early date (August 31 was suggested) would be set for opening bids, and all bids would then cease.

Approval or disapproval of the sale is likely to be postponed pending further study of issues raised in the case. One such issue is the commission involved. The 10 per cent fee asked by Guaranty Trust for handling the proposed sale is under attack by New York Atty. Gen. Jacob K. Javits. He filed a brief with the court objecting to the commission as "grossly excessive and unreasonable and substantially in excess of the market value in this community for the services rendered."

Supreme Court Justice Jacob Markowitz last week moved to appoint a referee to look into the issues. An attorney was due to be appointed by the week end.

U.O.P. assets . . . The value of the U.O.P. securities held in trust for the Petroleum Research Fund is now estimated at $50,000,000.

This represents a sizable appreciation since 1944 when the stock was turned over to the trust by the owners, Shell Oil Co., Standard Oil Co. of California, Standard Oil Co. (Ind.), Standard Oil Co. (N. J.), The Texas Co., and N. V. de Bataafsche Petroleum Mij. The transfer involved about $6 million in principal amount C notes with interest at 7 per cent, $2.5 in similar D notes, 111,000 shares of Class A common stock, 100 shares of Class C stock, and 100 shares of Class S stock.

Until recently U.O.P. has been plowing earnings back into the company. It had no recourse to other means of financing under the trust. Up to March 1954 the A.C.S. had received only $1,555,413.71 from the Petroleum Research Fund. Not until that time did it feel sufficient funds were on hand to start any of the research projects it had planned under the grant.

During its tenure of trust, Guaranty received $50,000 a year except for 1947 for a total of $525,000.

New Field Opened

Four Corners test points to third Arizona producer

FARMINGTON. — Arizona is about to get its third productive well and its second oil or gas field.

This is virtually assured by the strong gas flow El Paso Natural Gas Co. recorded in a drill-stem test last week in its Bita Peak wildcat in the northeast corner of that state, in Apache County.

Gas flow in the test, at 5,048-5,105 ft. in the Pennsylvanian-Paradox formation, was at the rate of 8,300,000 cu. ft. per day. Tester was open 1 hour and 8 minutes, getting gas at the surface in 2 minutes and stabilized flow after 10 minutes. Pressure was 1,620 psi., flowing, and 2,210 psi., shut in.

Hole has been drilled to 5,170 ft., where additional testing will be done.

The discovery, adding more fuel to the exploratory heat in the Four Corners area, is on the southern edge of the Paradox basin.

The well location is less than a half mile from the New Mexico line, and less than 5 miles south of the common corner of the four states of Utah, Colorado, New Mexico, and Arizona.

Nearby production . . . It is about 15 miles southeast of the East Boundary Butte anticline on which Arizona's two other productive wells are located.

It is about 6 miles west of a Paradox oil-discovery well completed last April by Humble Oil & Refining Co. on New Mexico's San Juan County side of the state line. That well was completed for 369 bbl. of oil and 55 bbl. of water per day, flowing through ⅜-in. choke with pay at 5,608-32 ft.

Arizona's first productive well, the discovery of the East Boundary Butte anticline, was completed by Shell Oil Co. in 1954 as a 2,000,000-cu. ft. gasser. The second well, ¾ mile southeast of Shell's discovery, was drilled by Humble Oil & Refining Co. It was completed in 1955.

Imports Fight Grows

Senate group joins producers in demanding limitations on foreign purchases; congressional action threatened

WASHINGTON. — Domestic producers are picking up powerful support in their fight to limit the flow of petroleum imports into this country.

Snowballing events of the past 2 weeks saw more than 30 United States senators line up with the producers in bringing pressure against the administration.

Senator Carlson of Kansas said last week he might sponsor legislation in January to establish oil-import quotas and Representative Ikard of Texas declared the Government should abandon its voluntary-restrictions plan and "impose the force of law."

Senator Neely of West Virginia predicted on the Senate floor that "failure to reduce substantially the amount of oil imported into the United States during the remainder of 1956 will result in enactment of restrictive legislation immediately after the convening of the next Congress."

The congressional outbursts followed by several days a meeting between 19 oil trade associations and Mobilization Director Arthur S. Flemming.

Presidential action urged . . . The group, in a formal statement to Flemming, announced it would petition for presidential action to force cutbacks of foreign purchases. The petition should be ready this week. It will urge Flemming to make the recommendations to the President.

Robert L. Wood of Midland, Tex., president of Independent Petroleum Association of America, indicated the petition would probably lead to a public hearing by the ODM, possibly after he receives a report from the task force of the President's Cabinet Committee on Fuel Policy. The report is due in mid-September.

The domestic producers want the Government to follow the cabinet committee's original recommendations, a compromise formula designed to limit imports to 16.6 per cent of domestic production. This is the ratio which prevailed in 1954.

Blunt reminder . . . The group bluntly reminded Flemming that voluntary restrictions have failed to keep imports from exceeding the 1954 relationship.

They said the foreign flow of oil has exceeded the limits by 200,000 bbl. of oil daily during the first half of 1956 and are scheduled to climb to 371,000 bbl. daily over that standard during the second half of the year.

The association contended "the adoption of the so-called defense amendment to the 1955 extension of the Trade Agreements Act recognized that oil imports in excess of the 1954 relationship to domestic production would endanger the national security."

Senators' letter . . . Senatorial pressure came from 15 Republicans and 16 Democrats who sent a joint letter to Flemming. It read in part:

". . . We would appreciate any further advice or information you can furnish us as to this matter, including whatever assurances you can give us that action will be taken to carry out the intent of the defense amendment to hold oil imports to the 1954 relationship."

Sticks to guns . . . Despite the furor, however, Flemming made it clear he will continue to press for voluntary compliance by importers. His office revealed it is "making considerable progress" in its move to cut out excessive imports.

Original importers' statements, it disclosed, put imports at 91,000 bbl. daily above the recommended amount. Since Flemming's recent appeal for cutbacks, the excess has dropped to 41,000 bbl. The ODM is hoping to bring the figure to zero by the time the final reports of intentions come in early in September.

However, Flemming "confirmed" by inference that he would go ahead with a public hearing on the matter after he receives the petition being prepared by the domestic producers.

Flemming asserted that his reexamination of the oil-import question is not a delaying tactic, as has been charged.

DISCUSSING PETROLEUM-IMPORTS problem in Washington meeting were, standing from left, Stark Fox, Oil Producers Agency of California; Edward S. Martin, Southwestern Pennsylvania Producers Association; W. E. Shrider, Ohio Oil and Gas Association; M. G. Powers, National Stripper Well Association; and E. Bruce Street, West Central Texas Oil and Gas Association. Seated from left: Robert L. Wood, Independent Petroleum Association of America; Defense Mobilizer Arthur S. Flemming; and A. E. Herrmann, Texas Independent Producers and Royalty Association.

Shoreline Buys Rock Hill

SAN ANTONIO.—Shoreline Petroleum Corp. has purchased the assets of Rock Hill Oil Co. and Rock Hill Drilling Co. for an undisclosed sum.

The transaction includes 4 drilling rigs, 432 producing oil wells and 62 producing gas wells, 3,700 net nonproducing royalty acres, 2,500 net producing royalty acres, several large producing water floods and cycling units, and an interest in some 135,000 acres of undeveloped oil and gas leases.

Rock Hill's production has been running about 3,500 bbl. daily from 182 leases in Texas, Oklahoma, Kansas, Illinois, Indiana, Nebraska, Montana, Colorado, and New Mexico. A substantial increase is expected with completion of planned water-flood programs.

John D. Sanford, Rock Hill vice president, will be executive vice president and general manager of Shoreline. Thornton C. Huddle is president. The Rock Hill organizations will be kept intact.

Rock Hill, a closed corporation, was owned by employes of Tret-O-Lite and Petro-Lite. It was consolidated from the old Monday and Tuesday oil companies and Lunes Drilling Co.

Houston now in oil business . . .

. . . City Dump Well A Producer

HOUSTON.—A city-owned garbage dump has put more than 600,000 Houston citizens in the oil business.

Trice Production Co. last week completed its first well on the 300-acre Holmes Road garbage dump as a 183-bbl. per day producer. Flow was gaged through a 14/64-in. choke from the Vicksburg sand at 8,102-14 ft. Tubing pressure was 255 psi.

Trice, which paid the city $25,200 bonus for the 300-acre lease, was preparing late last week to spud its second well on the fly-infested dump. The 2 Houston City Dump will be in the southwest corner of the property, some 800 ft. south of No. 1.

The city has a one-quarter royalty interest in the lease, located on the eastern flank of the old but recently revived Pierce Junction field. Heirs of the former owners of the property will receive an additional one-eighth royalty under terms of the lease.

Pierce Junction, at the south edge of Houston, was discovered in 1921. Despite intermittent drilling sprees on and around the salt-dome formation, the field's production had dropped to a trickle of about 3,000 bbl. daily in 1954. Late that year the new production was found in Vicksburg sands off the east flank. In recent months dozens of operators have entered the play, completing an average of about 20 wells monthly, most of them producers. Daily production has soared to more than 19,000 bbl.

Completion of the first well on city property sent municipal officials rushing to their calculating machines. City Treasurer Henry Kriegel came up with the estimate that the first well alone will net Houston citizens about $40,000 annually. Plans call for drilling up to 30 wells on the property.

Trice drilled to 11,400 ft. to test possible lower pay zones not productive elsewhere in the field. Shows reported earlier at about 10,635 ft. proved nonproductive, and the test was plugged back to 8,206 ft.

Texans Raise Import Hue

ABILENE, Tex.—This West Central Texas producing area, hit by price cuts and hard-pressed to find takers for new oil at any price, will play a key role in a new drive by independent producers for legislation to limit imports.

Producer hardship in the area will be referred to frequently to back up a petition urging the Office of Defense Mobilization to advise the President that voluntary restraints have failed. The petition is being prepared by 19 producer associations.

The associations are driving hard to compile a large number of "case histories" showing how increasing imports are working hardships on independent producers. West Central Texas is expected to furnish a large number of such instances.

Profitable Flood

● West Texas operators in Adair Wolfcamp field hope to recover 28,000,000 bbl.

MIDLAND, Tex.—Operators in Adair Wolfcamp field in West Texas expect to recover a whopping 28,000,000 bbl. of added oil via a unit pressure-maintenance project to be launched soon.

Value of the added output at present prices would be about $68,000,000.

The unit and flood will include all the field's 2,844 acres and 63 producing wells. Adair straddles the Gaines-Terry county line and produces from the upper Wolfcamp at about 8,500 ft.

The field is less than 6 years old. Despite its youth, however, Adair's pressure has plunged from 3,513 psi. at its discovery in September 1950 to the present figure of 1,161 psi. The big pressure drop occurred while the field was producing only about 8 per cent of the 111,000,000 bbl. of oil originally in place.

The decline lent impetus to operators' efforts to unitize the field and bolster the Wolfcamp's inefficient solution-gas drive.

Amerada Petroleum Corp., proposed unit operator, took the plan before the Texas Railroad Commission last week for its approval. It is almost certain to get the green light soon.

All working interest holders in the field have signed the unit agreement and more than 91 per cent of royalty interests are going along. Other large operators in the field are Atlantic Refining Co., Union Oil Co. of California, Cities Service Oil Co., and Humble Oil & Refining Co.

The flood plan . . . The operators have agreed on a perimeter flood and will inject water both above and below the water-oil contact.

Three input wells, all converted producers, will inject about 9,460 bbl. of water daily at pressures up to 3,000 psi. The input rate will exceed fluid production, now running at about 5,980 bbl. daily, by 58 per cent.

Input water will come from shallow wells completed in the Santa Rosa formation between 1,400 and 1,900 ft.

Amerada figures that the Wolfcamp by primary means would produce only about 25,000,000 bbl. or 23 per cent of oil in place. The flood will increase ultimate production to 53,000,000 bbl.

It would take 27 years to get the remaining oil recoverable by primary methods. Only 5 years more, or 32 years, would be needed to flush out the 53,000,000 bbl. recoverable with pressure maintenance.

Steel-Strike Scoreboard

REFINING:

Current and new projects for which steel was not already on hand will be delayed 45 to 60 days, some longer. New plants and units will have on-stream dates pushed back. Over-all the timetable for an estimated $850 million in construction was upset. Cost estimates for all projects will have to be raised. Loss of fuel-oil sales to mills softened the resid market.

PIPELINES:

At least one major project was shut down and completion and starting dates for others have been delayed. Colorado Interstate halted pipe laying on its big-inch line in Wyoming just after it started. Contract awards have been delayed on Trans-Canada pipeline; its December completion target is a question mark, and total cost may be hiked $6 million. Other lines will be hit proportionately.

DRILLING:

Some 200 rigs idled. Lost revenue to contractors runs into the millions of dollars. It will be months before the active rig total returns to the prestrike level. Operators have cut around 2,000 wells from second-half plans and will be plagued by a pipe shortage probably into 1957. Operators and contractors will pay more for steel.

PRODUCTION:

Development will bear the brunt of the drilling cutback, delaying plans to bring new fields to full production. Total production is not affected because of the big excess producing capacity in this country. Higher steel prices will raise lifting costs considerably. Pumping units already have been increased 10 per cent.

Strike smoke clears, industry sees . . .

. . . Where the Strike Hurt Oil Men Most

THE steel strike is over, but the oil industry is just beginning to count its cost.

Months after the furnaces have been fired once more and the mills are rolling pipe, rude reminders of the nation's fifth postwar steel strike will be around.

Its impact will be felt in:

. . . **Higher costs** throughout an industry which is using steel at the rate of 6,000,000 tons a year.

. . . **Tightened squeeze** on drilling contractors who will probably have to absorb higher prices for drill pipe, and on companies which have seen materials and labor costs mount steadily since the last crude-price increase more than 3 years ago.

. . . **Irrepluceable loss** of 7 weeks' steel production at a time when mills were running near 100 per cent of capacity to keep up with demand.

. . . **Continued shortage** of all steel products for the foreseeable future, upsetting plans and plaguing operations well into 1957.

. . . **Revenue loss** to contractors whose rigs gross $400 to $1,300 daily on land and much more offshore, plus the fixed cost borne by contractors and companies alike for keeping expensive rigs idle.

. . . **Construction delays** for plant and pipeline projects.

Steel-company officials said the strike probably cost them 7 weeks' production, counting the half-week loss when furnaces were banked preparing for the shutdown and the time it takes to bring mills to full operation again.

Time out for repairs and the gradual startup to avoid disintegration of furnace linings will mean production can't reach 90 per cent of capacity in less than 2 weeks. It was running at about 17 per cent when the strike ended with this tonnage being accounted for by the few companies whose labor contracts had not expired. But it will be a very slow process raising production that last 10 per cent, and full deliveries will be delayed accordingly.

The shutdown places mills in the position of starting on third-quarter orders near the end of that period. Some second-quarter deliveries had not been completed. Some suppliers doubt that many fourth-quarter orders can be filled and others raise the possibility of blocking out the quarter entirely and accepting only first-quarter orders for 1957 to get current on their books.

One of the few big plants not affected by the strike said it was operating at more than 100 per cent capacity and "shoving steel out the front door as fast as it is made." But this didn't make a ripple on the over-all supply situation.

The one bright spot of the agreement is the 3-year, no-strike provision

won by steel management, the first of that length in the history of the industry.

It at least promises a measure of stability that up to now has been notably absent from steel supply. That may bring more balanced buying and better distribution of the stocks available and discourage buying to protect against a strike.

Drilling

Contractors . . . Many big contractors found themselves in an excellent position to weather the strike.

Some could not tell there was a strike on, so far as the effect on their operations was concerned. They did not shut down a rig for want of steel. The strike found them on deep wells and big programs and no rigs that came down were caught in the switch.

But this was not the general situation by any means. More than 200 rigs were shut down because of the strike, and it will be months before the active rig total reaches its prestrike level. After the 8-week strike in 1952, activity did not recover until the end of the year.

Hughes Tool Co. reported 2,536 rotaries were active July 30, off 283 from June 18 when the year's peak was reached. The July 30 total was the lowest since February when bad weather always cuts drilling. A survey by The Oil and Gas Journal indicated the strike idled a bigger percentage of cable-tool operators, many of them reporting their business was halved.

Rotary operators, who usually keep 75 to 80 per cent of their rigs running, were down closer to 60 per cent industrywide, and in local instances below even that level.

California hard hit . . . California contractors reported only 57.8 per cent of their rigs working last week.

This is the lowest number of rigs active in 18 months and compares with 76.4 per cent the same week a year ago. The California Drilling Contractors Association reported that 68 of its members had 230 rigs available and only 133 working. The pinch hurt most in San Joaquin Valley where contractors reporting to the association had 41 rigs idle against only 11 a year ago.

The pipe shortage is not the only villian here, of course. Equal blame is laid to disappointing wildcat results. There has not been a major California discovery in recent months.

Troubles ahead . . . But the end of the strike did not mean the solution to their woes by any means.

One contractor who came through the strike in fine shape said, "The nervous part of it is still ahead. What we're worried about now is the next go-round when our rigs finish current jobs. Steel shipments won't be coming in volume for several weeks yet and we may feel the strike more a month after it's over than while the mills were actually shut down."

Others expect pipe to loosen up and "come out of hiding" now that the dispute is settled. It depends on how carefully majors want to guard remaining stocks.

One contractor complained he had to stack a rig when a major company postponed a deep test for the duration of the strike. "It wasn't because they didn't have casing," he said. "They just didn't want to commit it. However, they may use inventories a little freer now."

The pessimists' outlook was represented by this viewpoint: "So the strike is over. We don't have any more pipe than we did yesterday. It will take a long time to get back on our feet."

Generally speaking it was the small rigs that bore the brunt of the drilling cutback. Not many big rigs were shut down. They may keep going 90 days or longer on a single location in the deepest areas.

Generally speaking, contractors came out of the strike worse off than before. "Besides the loss in down time," a spokesman pointed out, "we must absorb higher steel costs ourselves, and the higher drilling costs for operators lessens any chance we may have had for improving our own prices."

Impact on operators . . . The scramble for steel is still going on, but premium-price used casing—popular during the strike—is fading from the picture.

Offshore operators have a double worry—getting enough steel for new platforms and alloy pipe for deep wells to fulfill drilling requirements on expiring leases.

Operators expect two "crises" during the next 6 months. One will come within the next month or two while companies with little steel wait for mills to resume deliveries. The other will hit when major companies which came out of the strike with steel left run short when this is drilled up and stocks have not yet been replenished.

A few of the biggest companies will not cut their well programs materially for lack of pipe, but the majors are not all immune from the shortage.

Union Oil Co., for instance, cut back the first of July. It was buying casing and tubing only from well to well and was caught with no inventory cushion to last until deliveries were resumed.

Magnolia Petroleum Co. had 115 wells going before the strike and is now down to 80. "We're not moving any faster now that it's over and won't until deliveries of casing start coming through again," a company spokesman said.

British-American Oil Producing Co., Dallas, has already deferred 12 development wells until next year. "We are going on an assumption that deliveries will not be delayed more than a month since the steel strike lasted about that long. If deliveries should be delayed longer than this, say 2 months, we'll have to do more deferring, possibly losing 20 or more wells this year."

D. D. Feldman Oil & Gas, a large Dallas independent, also said it has had to slow its drilling somewhat but doesn't expect to be hurt.

Getting the right pattern on casing continues to be a problem. There are cases of companies being forced to use or buy 7-in. casing where only 5½-in. is needed.

The Journal found widespread fear in the oil industry that all fourth-quarter tonnage would be lost, since mills might be as late as December in cleaning up the third quarter. They held out little hope for normal deliveries before midyear 1957.

Refining

Most engineering-contracting firms checked had projects now waiting for steel or expected to have later. Lack of steel directly involves 200,000 bbl. per day in new crude units, 150,000 bbl. per day in catalytic cracking, and over 200,000 bbl. per day in catalytic reforming *(The Oil and Gas Journal, July 9, page 58)*.

Most of this capacity will be delayed up to 60 days in coming on stream. The pinch will be felt most in reforming units, which are needed to keep companies abreast of the octane race. The spread of 100-octane marketing has sharply increased the pressure for completing quality-improvement processing and any delay is serious.

Every new unit will cost more, and contractors as well as refiners may be hit. The primary contractors who bid low escalations in turnkey contracts, gambling on the new price of steel, could find themselves buying some steel that they hadn't counted on.

Lack of steel pushed fabricators behind 12 weeks in some cases on pressure vessels, heat exchangers, and other units ordered for new plants. The plants will be delayed accordingly.

Some shops were kept busy on smaller orders that would not have been filled until later, but lack of plate and

structural steel for bigger jobs forced layoffs in fabricating plants.

"We don't expect to catch up on orders until next year at the very earliest, and perhaps not then," one big fabricator stated.

Heavy-fuel loss . . . The steel strike also caused stocks of heavy fuel to climb around 700,000 bbl. a week, a volume roughly equal to normal consumption by the struck mills. Stocks reached their highest point since last November.

The result was a soft market, with low-sulfur resid in the Mid-Continent and on the Gulf Coast going for what the less desirable high-sulfur product normally brings. No further break in the market was expected. However, it may be some time before refiners regain their prestrike market position.

Pipelines

Pipeline companies have been laying as much pipe as mills have been able to turn out for some time, and current and planned projects indicate steel demand will exceed the supply for several months to come.

Colorado Interstate Gas Co. had to stop pipe laying the first week of the strike on its 238-mile, 22-in. line from Laramie to Green River *(The Oil and Gas Journal, July 23, page 57).*

It had moved 3.3 miles when the strike hit, and R. H. Fulton & Co., the contractor, ran out of pipe at 5 miles. Pipe laying was halted until the middle of August. Deliveries are scheduled then from Kaiser Steel Corp., Oakland, which operated at full capacity or more throughout the strike.

Kaiser raised the price of line pipe $11 a ton, anticipating the industry-wide hike, which will probably add an extra $500,000 to $750,000 to the cost of the line.

Trans-Canada Pipe Lines, Ltd., is still hoping to complete the Alberta-Winnipeg section of its 2,250-mile line this year, but has only two of seven spreads working on the 574-mile leg. Only about 120 miles of the 34-in. pipe was available before the strike, and it's a question of whether the three mills which are to supply the pipe can roll enough to keep spreads busy.

Trans-Canada says, however, that its loan agreement with the Canadian Government takes into account such an emergency and the deadline is flexible.

The pipe shortage also might delay starts on major projects of El Paso Natural Gas Co., Westcoast Transmission Co., Ltd., Plantation Pipe Line Co., Southern California Gas Co., and Southern Counties Gas Co., American Louisiana Pipe Line Co., and Transcontinental Gas Pipe Line Corp.

watching WASHINGTON

. . . with Bertram F. Linz

High court may review FPC orders . . .

THE Supreme Court may get another bid this fall to review the Federal Power Commission's No. 174 orders.

The issue will come to Washington if the Fifth Circuit Court at New Orleans turns down a request for rehearing of several of 33 cases recently decided in favor of the FPC. The cases involved both the 174 orders and the commission's rate-suspension order.

A majority of the New Orleans court held that administrative orders which are not final orders issued after hearing are not appealable. It held in effect that such orders do not adversely affect anyone since they do not require him to do or refrain from doing any act.

One judge agreed with the producers' attorneys that the 174 orders do adversely affect independent producers of gas because they limit his actions. They must secure certificates, automatic increases in contract prices are made subject to FPC action, and deliveries cannot be stopped even when a contract expires.

Several other federal courts have held that such orders can be appealed and the Supreme Court also ruled so in two recent cases. The District of Columbia Federal Court held late last month that all orders of federal agencies must show definitely the facts on which they were issued, so that they may be intelligently reviewed.

The Supreme Court refused to review the 174 orders last term.

Asphalt gets a boost . . .

THE new road-building program will open up a market for 128,000,000 tons of asphalt, spread over the next 13 years. That is the amount of bituminous material the Bureau of Public Roads estimated will be needed for the $33,000,000,000 project approved by Congress this year.

The work will also take 13,280,000,000 gal. of gasoline, diesel oil, lubricating oil, and grease, it is figured.

In 1955 road building took 5,850,000 tons of asphalt and 652,000,000 gal. of oil products. Next year it will take 8,730,000 tons and 908,000,000 gal. The peak will be reached in 1960. Through 1967, some 10,180,000 tons of asphalt and 1,059,000,000 gal. of oil products will be used yearly.

Navy wants a new look at oil shale . . .

NAVY Department next year will ask Congress for money for research on oil shale at the Rifle, Colo., plant it took over from Interior this month.

The Navy isn't going to pick up Interior's work on synthetic fuels from shale, however. What it wants to find out is whether gasoline, jet fuels, and other products from shale can be used for military purposes. That is a point, officials say, which was not developed by the Bureau of Mines.

What the Navy wants to know, specifically, is whether these products can be made to meet military specifications and whether they can meet those specifications so closely as to permit storage in the same tanks with similar products from petroleum.

The Navy isn't too interested in synthetic fuels. Its own holdings of shale are only a small part of the reserves in the Rocky Mountain area. The economics of shale oil is a major problem. Transportation is only slightly less. Its experts believe that when shale oil comes on the market there will have to be scores of plants and hundreds of mines to produce a really substantial volume.

Eventually there will be a shale-oil industry. If its products meet military requirements they will add to the Navy's supply sources. If they don't they can be put to civilian use, releasing petroleum for the military. The Navy wants to know which it will be.

Price Cuts General

● Humble and Shell join others in reducing postings in West Central Texas

HOUSTON.—A 7-cent price cut on crude became general in West Central Texas last week when Humble Oil & Refining Co. and Shell Oil Co. announced lower postings for the area.

The latest action brought to 21 the number of counties affected by the lower postings. The movement was described earlier as a readjustment of prices to bring them in line with the oil's refining value *(The Oil and Gas Journal, July 23, page 64, and July 30, page 124)*.

The new posted field price ranges from $2.83 per bbl. to $2.41 depending on gravity of the crude. Top-quality crude in the area previously had sold for $2.90 per bbl.

Area affected . . . Humble's price cut covers nine counties in West Central Texas.

Six of the counties involved—Fisher, Callahan, Eastland, Haskell, Jones, and Shackelford — are in Texas Railroad Commission District 7-B, already hardest hit by price adjustments of other purchasing companies.

The Humble cut also affects King County in neighboring District 8 and Coke and Runnels counties in District 7-C near by. In Coke County, Humble's new posting involves only the portion of Fort Chadbourne field which overlaps from Runnels County. Most of Coke County production is classified as West Texas intermediate and already carried a 7-cent per bbl. price differential.

Humble's new prices cover about 22,000 bbl. of crude per day which moves from the affected area through its pipeline to the Gulf Coast. This total includes about 10,000 bbl. daily of Humble's own production.

Humble has a net production in the area of 14,000 bbl. daily. But about 4,000 bbl. daily goes to other purchasers, including Cities Service Oil Co. and Stanolind Oil Purchasing Co., which previously announced price reductions.

Others follow . . . A smaller independent, Scurlock Oil Co., quickly followed Humble's action with a similar 7-cent cut.

Scurlock sells Humble about 2,000 bbl. daily gathered from the affected fields and also sells some crude to Sinclair Crude Oil Co.

Other purchasers in the area now are expected to drop their postings.

Humble declined to state whether its decision was prompted purely by competition or whether refinery yields from West Central Texas crude were considered too low to justify the premium price. Most of Humble's production from the price-cut area is refined in its Baytown, Tex., plant.

Shell's new postings cover all fields in Jones, Fisher, and Stonewall counties where it buys. The counties all are in Railroad Commission District 7-B. The 7-cent reduction applies to about 12,000 bbl. daily which Shell buys in the counties.

B-A Tests Strike

Its discovery in East Texas is good for 259 bbl. daily

DALLAS.—British-American Oil Producing Co. has run potential test and final gage on its 1 Bessie Weisenhunt, Wood County Woodbine strike on the Hainesville salt dome in East Texas.

The well made 259 bbl. of 44.4°-gravity oil in 24 hours through ¼-in. choke, from perforations at 9,217-22 ft. and 9,228-47 ft. Tubing pressure was 550 psi., and gas-oil ratio during the first 12 hours of flow was 656:1.

The well was reported still recovering some drilling mud with the oil and is believed not yet cleaned up. The company plans soon to run a series of casing-pressure tests further to evaluate the strike.

It expects to announce one and probably two offset locations in the near future.

Pipeline System Absorbed

TULSA.—Service Pipe Line Co. has acquired the crude pipeline facilities of Pan-Am Southern Corp. These include 285 miles of lines in southern Arkansas and northern Louisiana, and the 52-mile Pine Island gathering system in northwestern Louisiana.

The acquisition is part of a Standard Oil Co. (Ind.) plan to consolidate a number of subsidiaries engaged in similar functions. It gives Service Pipe Line, with 13,000 miles of lines, its first operations in Arkansas and Louisiana.

The longer system functions in Union, Columbia, and Ouachita counties of Arkansas, and Union and Claiborne parishes of Louisiana, moving crude to the Pan-Am refinery at El Dorado, Ark.

Service has also purchased two southern Louisiana gathering systems from Stanolind Oil & Gas Co. These are the Hackberry system in Cameron Parish and the Jennings system in Acadia Parish.

Processing BRIEFS

SARNIA. — Canadian Oil Companies, Ltd., has let a $3,000,000 contract to Fluor Corp. of Canada, Ltd., for engineering work and erection of a petrochemical plant at its Sarnia refinery. The plant will include a 3,650-bbl. Udex unit and a 4,400-bbl. Platforming unit. The Platformer will produce charge stock for the Udex plant which will extract chemically pure benzene, toluene, and xylene from petroleum.

WASHINGTON.—New England Industries, Inc., has been granted a certificate of necessity covering $14,305,000 for proposed expenditure for aviation alkylate facilities at Bellingham, Wash. The grant permits rapid amortization of 100 per cent of $9,900,000, 40 per cent of $4,255,000, and 15 per cent of $150,000.

CHURCH POINT, La.—Sunray Mid-Continent Oil Co.'s big cycling plant at nearby Northwest Branch is in full production, processing some 690,000,000 cu. ft. of gas and 65,500 bbl. of stabilized distillate a month. The plant maintains what is probably the highest gas-injection pressure in the field of cycling operations. Compressors build pressure to 6,600 psi. to inject "dry" gas back into one sand formation at Northwest Branch field.

CORPUS CHRISTI.—A 5,000-bbl. Platformer has gone on stream here at Pontiac Refining Corp.'s 37,000-bbl. refinery. It brings the plant's Platforming capacity to 13,000 bbl. daily.

NEW ORLEANS.—Bay Petroleum Corp. has completed a construction program at its refinery here which added a 5,000-bbl. Platformer, a second fractionating column and auxiliary equipment to the crude unit, and a new main fractionating tower to the catalytic cracker. Basic capacity of the plant was increased by 5,000 bbl., to 23,500 bbl. daily. Bay is a subsidiary of Tennessee Gas Transmission Co.

BILLINGS, Mont.—A sulfur plant 4 miles east of here has been placed on stream by Montana Sulphur & Chemical Co. Using hydrogen sulfide gases obtained by pipelines from the nearby Carter Oil Co. and Continental Oil Co. refineries, the new plant is producing 30 long tons of sulfur daily. Total capacity is 40 long tons per day. The waste gases formerly were flared or used as fuel by the refineries.

Badger Manufacturing Co., Cambridge, Mass., furnished design and engineered the plant. Proctor Engineering Co., Tulsa, was the general contractor.

Shamrock Seeks Cause of Blast

AMARILLO, Tex.—Shamrock Oil & Gas Corp. last week called in refinery safety consultants to help find out what caused the July 29 fire and explosion at the tank farm of its McKee refinery near Dumas.

The tragedy claimed lives of 19 firemen, injured 31 others, destroyed four tanks and their products at a loss of about $500,000. The 20,000-bbl. refinery and a nearby natural-gasoline plant escaped damage. They were shut down temporarily as a precaution but had resumed normal operations at midweek.

Big question now is what caused the leak of the volatile mixture of pentane and hexane that triggered the original fire and disastrous explosion.

Officials say this much is known: Vapors from a 15,000-bbl. spheroid tank of pentane and hexane apparently spread downhill to an asphalt tank under which a small fire was kept. This ignited the vapors and they flashed back, starting a small fire at the spherical tank.

The gage hatch on top of the tank was blown off and the flames at first came straight up from the hatch hole and popoff vents. At the same time flames developed in the dike from liquid around the tank.

Volunteer firemen and plant personnel attempted to smother the flames with foamite. They battled for nearly an hour and were preparing to move closer with additional equipment when the alarm was sounded to evacuate because the heat was becoming too intense.

Many of the men were too late. The tank went up with a whoosh. Balls of fire shot in all directions. They snuffed up the oxygen in the area. All 19 men within a 100-yd. radius of the tank were killed—16 at the site and 3 later from burns. Others not so close managed to escape and are recovering.

Officials of the Texas fire marshal's office and fire-insurance companies investigated, but were unable to determine how the vapor first leaked. A Washington consultant is being called in to help the inquiry.

Shamrock officials said the plant and tank farm underwent a special inspection only July 20. Everything was functioning normally then. Safety engineers also went over the plant 2 years ago and at that time it was brought up to all modern safety standards.

Only explanation at present is that the vapors escaped from a line break or pump leak or from the popoff vents at top of the tank.

Two nearby crude tanks and an asphalt tank also ignited. Luckily closest tanks containing volatile products had floating roofs and did not catch fire. The vent on a fifth tank ignited and a sixth smouldered, but fires on both were extinguished.

Wildcat Blows Wild

JAL, N. M.—Continental Oil Co. was still battling hard last week to stifle a big gas blow at Bell Lake, 25 miles northwest of here.

The Unit 4 wildcat blew out 2 weeks ago and has been flowing an estimated 30,000,000 cu. ft. of gas a day. The well was capped and shut in at one time, but the gas channeled and broke out to the surface through nearby seismic-shot holes.

Operator was forced to reopen the hole, which is bottomed in Pennsylvanian shale at 13,393 ft. The Lowe Drilling Co. rig on the project has been moved off and a smaller unit moved in for another crack at stopping the flow.

Gas Drive Varied

Special mixture is planned by Humble in Seeligson pay

KINGSVILLE, Tex.—Humble Oil & Refining Co. is planning to try a variation of its "condensing gas drive" method of secondary recovery in an oil pay in huge Seeligson field in South Texas.

The company is awaiting a permit now from the Texas Railroad Commission to inject rich casinghead gas in Bronte field, West Texas, to hike recovery from the Goen and Cambrian reservoirs *(The Oil and Gas Journal, July 16, page 70)*.

At Seeligson, Humble wants to inject a half-and-half mixture of propane and separator gas into that field's Zone 20-B oil pay at 6,200 ft. It plans to inject 35,000 to 40,000 bbl. of propane and about 50,000,000 to 55,000,000 cu. ft. of gas a month.

Zone 20-B has 648 developed acres with 12 wells. The entire reservoir underlies a Humble lease. Crude in this pay, however, is saturated whereas that in Bronte's Goen and Cambrian reservoirs is undersaturated.

Humble feels that the method will not work as well in reservoirs with high gas saturation. The company wants to try the program in the 20-B pay for 2 years. During that time it figures it will have injected products worth about $1,500,000. If it proves successful, the technique would be expanded to other reservoirs in the field. In this connection, Humble plans to build a major gasoline plant at a cost of $20,000,000 to $30,000,000.

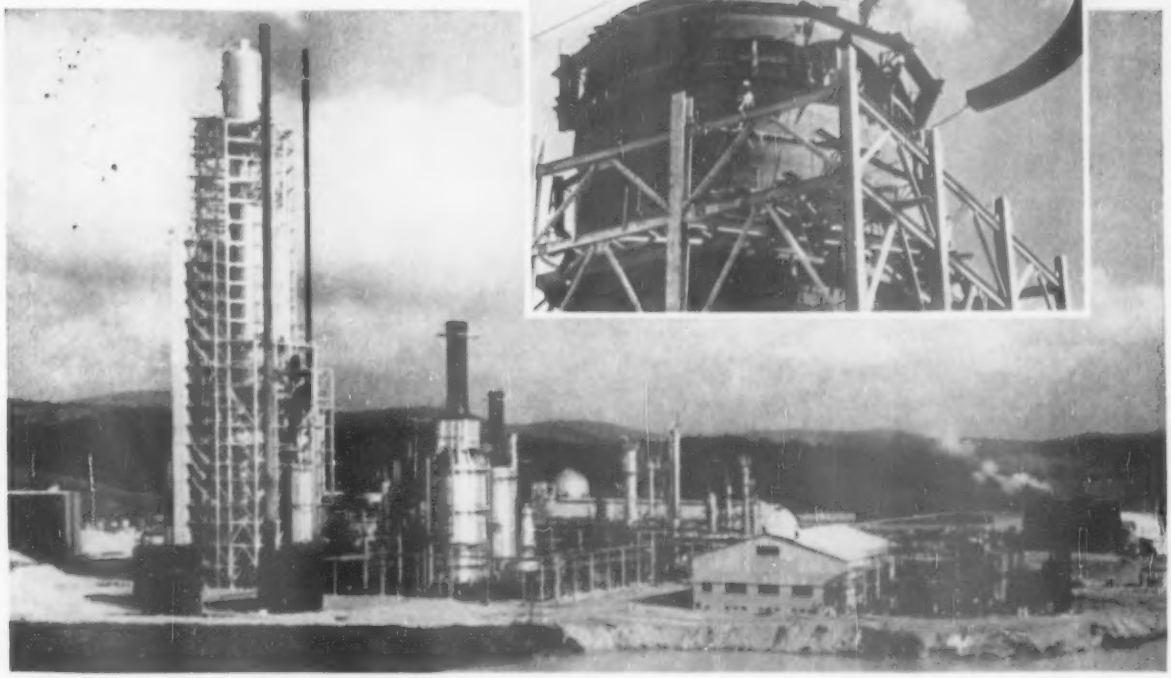
The company thinks the condensing gas drive will increase ultimate recovery from the 20-B pay to 475 per cent, from 1,250,000 bbl. primary oil to an ultimate take of 7,200,000 bbl. The technique is capable, Humble believes, of generally hiking recovery to 60 to 100 per cent of original oil in place in a field.

Due to the high cost of injected liquids, Humble proposes that field rules for 20-B provide for an oil allowable credit on an injection-fluids value basis to compensate it for products it otherwise could sell.

The Texas Railroad Commission currently is reviewing both the Bronte and Seeligson applications.

1 ST TYPE 120 T.C.C. UNIT

erected at Capuava Refinery by CB&I



Top: An air duct section for the TCC kiln being raised into place.

Bottom: General view of Capuava Refinery.

• Fourteen miles north of Sao Paulo, Brazil, at Capuava, a main fractionating tower and the *first* type 120 Thermofor unit to be built was erected by Chicago Bridge & Iron Company in cooperation with their subsidiary, Sociedade Chibridge de Construcoes, Ltda. Both of the units were fabricated at our Greenville, Pa. plant and furnished through Hydrocarbon Research, Inc., New York, for Refinaria e Exploracao de Petroleo "UNIAO" S.A. The UNIAO refinery has a crude capacity in excess of 20,000 bbls. per day and can handle a wide variety of stocks.

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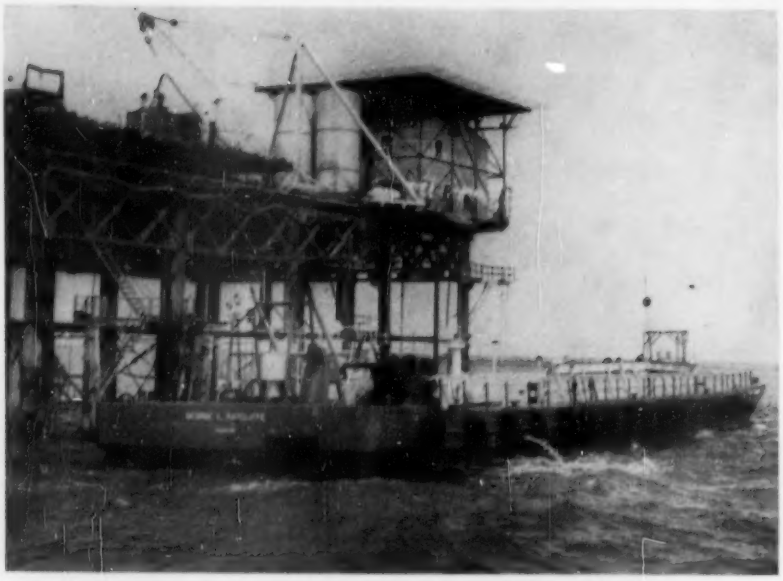


Mr. George, a new kind of delivery vessel, ties up to platform and starts an . . .

Offshore Innovation: "Mud Refueling"

HOUSTON.—Bulk drilling mud now can be delivered to offshore drilling rigs in much the same manner as Navy vessels are refueled at sea.

A new drilling-mud delivery vessel just put into operation by Baroid Division, National Lead Co., can pump 2,500 lb. of dry mud onto an offshore platform in less than 2 minutes.

The vessel, known as the George L. Ratcliffe, can carry 1,000 tons of bulk mud, plus 500 tons of bagged chemicals. It is 196 ft. long, 42 ft. wide, and 12 ft. deep.

The first unit of its kind, "Mr. George" is towed to a point near the well location by a deep-sea tug. Approach to the drilling structure is made under the supply vessel's own power.

Dry bulk mud is pneumatically pumped to the rig storage through a 4-in. rubber hose. The hose, 150 ft. long, is picked up by the rig crane and extended into tanks on the platform.

Home base for the new unit will be Baroid's marine terminal now being built on the New Orleans industrial canal. Baroid claims the terminal will have the largest mud warehousing facilities in the country.

Alberta Crude Record Tumbles

CALGARY. — Refineries using Alberta crude have set a new record in their nominations for August purchases. To meet the demand, daily average production for the month must be 447,711 bbl.

The province's production record was set last February, when output hit 413,119 bbl. daily. The increase in nominations was due mostly to the settlement of the strike at Shell Oil Co.'s Anacortes, Wash., plant, and a 12,000-bbl. nomination by Standard Oil Co. of California, a newcomer to Alberta.

Settlement of the Shell strike means an increase of 40,000 bbl. daily in actual deliveries. Each month during the lengthy strike, that amount was budgeted in expectation of settlement, but was never delivered.

During the 120 days the strike was in progress, it caused an estimated loss in production of 4,560,000 bbl. and a gross loss to producers of $11,400,000. Before the plant is back in full production it is expected to result in an additional loss of 618,000 bbl., valued at $1,545,000.

U. S. buyers . . . U. S. refineries will take a total daily average of 105,096 bbl., including the allotment for Anacortes, the biggest U. S. purchaser. Other U. S. refineries with bids to purchase and their nominations are:

General Petroleum Corp., Ferndale, Wash., 26,561; Standard Oil Co. of California, Richmond, 12,000; International Refineries, Wrenshall, Minn., 11,290; Northwestern Refining Co., St. Paul Park, Minn., 5,000; Lake Superior Refining Co., Superior, Wis., 4,520; Great Northern Oil Co., Pine Bend, Minn., 2,500; Bay Refining Corp., Bay City, Mich., 2,000; Dow Chemical Co., Midland, Mich., 1,000; and Union Oil Co., Cut Bank, Mont., 225.

The 12,000 bbl. for California Standard will be shipped by tanker to its refinery at Richmond.

Big takers . . . Imperial Oil, Ltd., again is the major bidder for the month, seeking 166,025 bbl. daily. Next is Shell Oil Co., with a nomination of 72,720. British American Oil Co., Ltd., wants 48,185 and Canadian Oil Companies, Ltd., have asked for 30,000.

The Interprovincial pipeline to the east will carry 198,980 bbl. daily and the Trans-Mountain line to the west will handle a daily average of 174,541.

Refinery to Close

Octane race forces Wilcox to shut plant at Bristow

TULSA. — Another small Oklahoma refinery has been knocked out by the relentless march of octanes. Wilcox Oil Co. is shutting down its 5,500-bbl. plant at Bristow this month.

Wilcox will continue its marketing operations with products manufactured by D-X Sunray Oil Co. The process arrangement is similar to the one worked out between D-X Sunray and Tidewater Oil Co. when the latter closed its 15,000-bbl. Drumright refinery in May 1955.

Wilcox disclosed it has sold 200 miles of crude gathering lines to Mid-Continent Pipe Line Co., which will integrate the system into its 2,700-mile Oklahoma network. The pipeline company is an affiliate of D-X Sunray.

F. H. Dunn, Wilcox president, blamed the refinery's closing on economic conditions brought on by the growing requirement for higher octanes.

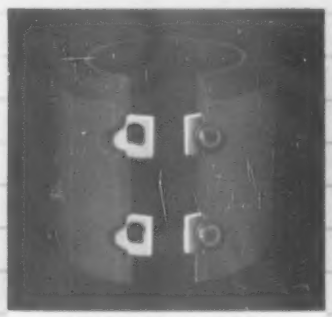
Substantial losses . . . He said refinery runs have been averaging 4,683 bbl. daily and that losses during the past 2 years have been substantial. The plant has a 2,250-bbl. thermal cracker, a 1,700-bbl. Platformer, and a 120-bbl. catalytic polymerization unit. Dunn said his company has no immediate plans for the Platformer, which is 3 years old.

Wilcox, whose 1955 net crude production averaged 2,626 bbl. daily, was one of the pioneers of crude gathering systems in Oklahoma. The system being transferred to Mid-Continent handles 5,000 bbl. of crude daily from 725 wells on 300 leases in Creek, Lincoln, Okfuskee, and Seminole counties.

Here's how to combine Safe-Lok and Stretch-On Protectors for maximum protection at lowest overall cost!

Use Safe-Loks at top of string

Use "Stretch-Ons" below Safe-Loks to bottom of casing



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PB PROTECTORS

Two different types of PB drill pipe and casing protectors are in use today. One is the popular PB "Stretch-On" which has been the favorite of the oil patch for years. The other is the relatively new PB Safe-Lok Protector which drilling crews can install or remove in seconds. These two protectors are natural partners in casing protection. Here's how this combination benefits you:

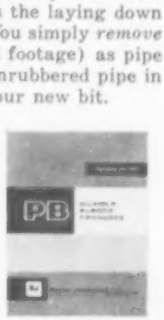
Safe-Loks are *time and money savers* at the top of your drilling string. Here their instantly removable and replaceable feature eliminates the laying down and picking up of rubbered pipe. You simply *remove* Safe-Loks (based on estimated bit footage) as pipe comes out of the hole, providing unrubbered pipe in the derrick for make-up behind your new bit.

You eliminate three time-wasting operations: (1) unnecessary transfer of rubbered pipe from derrick to pipe rack; (2) the handling of unrubbered singles from the rack for bit make-up; and (3) the return of rubbered pipe from the pipe rack for use within casing. Pipe is handled in *stand lengths in the derrick*. Safe-Loks are quickly replaced on unrubbered stands at the top of the string as you go back in the hole.

PB "Stretch-On" Protectors are used to provide protection on all pipe where protector removal and re-installation is not a factor.

Use this new money-saving PB protector combination on your longer strings. And use PB Safe-Loks exclusively on all shallow drilling.

Write for complete PB catalog . . .
including special clearance charts for selection of correct protector size.



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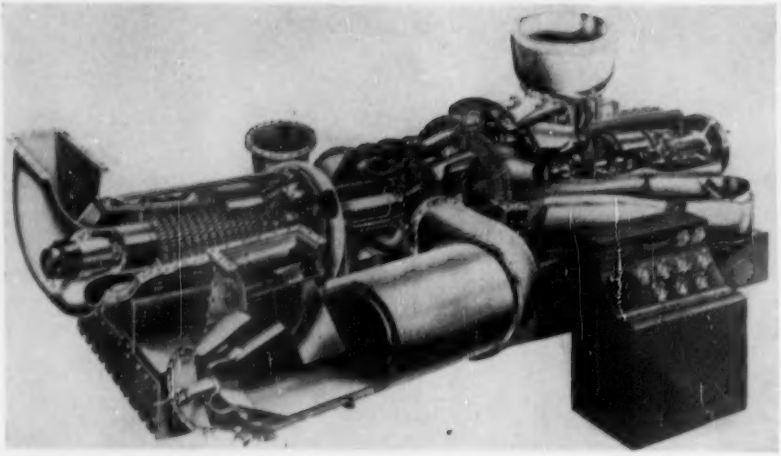


Medium-Power Turbine Shown

OLEAN, N. Y. — A new medium-power gas turbine was demonstrated here last week by Clark Bros. Co.

Designated the Mark TA, the turbine develops 1,130 hp. and is the first in that power range to be offered by a U. S. manufacturer. Other turbines made in this country are rated from 5,000 hp. up.

Because of its medium power the turbine will probably be used for field-compressor service, and in process industries where waste-exhaust heat can be used for steam generation.

Clark has been licensed to make and sell the turbine by the English firm of Ruston-Hornsby, Ltd. About 40 units of similar design made by Ruston-Hornsby are already in service, many in the petroleum industry in the Middle East.

The turbine is a simple-cycle, split-shaft machine designed much like Clark's 8,500-hp. unit. It develops a full load efficiency of 15.2 per cent. With regeneration, using exhaust to heat intake air, the unit has a thermal efficiency of 20.8 per cent.

These figures can be raised appreciably if low-pressure steam can be used. Waste heat from the exhaust can be partially recovered and will produce up to 9,500 lb. per hour of 50-psi. steam under full load.

Shaft-output speed is a governed 6,000 r.p.m. with gearing for lower or higher speeds.

The unit weighs 6 tons, is 16 ft. long, and can be broken into 8-ft. sections for road hauling.

Simplified controls . . . Starting power is by batteries which supply a 30-hp. d.c. motor. The unit is started by merely turning one control wheel through five positions. The turbine is ready to handle full load in less than 2 minutes.

The turbine shell is air cooled. It is unnecessary to rotate the unit after shutdown for protection of rotors and stators from residual heat buildup. Temperature of gas to the compressor turbine is only 1,340° F. The rotors can be inspected and maintained within an hour after shutdown.

There are no complicated controls or shutdown devices. Emergency shutdown is provided for only three conditions—high exhaust temperature, low lube-oil pressure, or overspeed.

L. A. Harbor Permits Sought

LOS ANGELES.—Applications for drilling on 3,200 acres of Los Angeles Harbor lands have been made by Standard Oil Co. of California and Edwin W. Pauley.

Pauley filed for permission to drill on 2,400 acres, including the southern part of the San Pedro district and all of Outer Harbor from Cabrillo Beach to the breakwater and easterly to the Los Angeles - Long Beach city boundary.

Pauley's application made no royalty offer, pointing out that he would prefer to discuss payments later because of the "wildcatting nature" of the proposed drilling.

California Standard applied for permits to drill on 800 acres from West Basin to Fish Harbor, and from the San Pedro district waterfront to Terminal Island.

The company offered the Harbor Department $40,000 annually for 5 years, with royalties ranging from 32 to 50 per cent to be applied against the annual payment. If royalties exceed this amount, the excess would go to the harbor department.

Premium Dips

● Rating drops slightly on monthly Ethyl survey; regular average inches up

NEW YORK.—Premium - grade octane numbers dipped slightly in July while antiknock ratings for regular-grade gasoline inched upward. The monthly survey conducted by Ethyl Corp. showed the weighted average research octane number for 850 samples taken in 53 marketing centers to be 96.9 for premium and 90.1 for regular.

These averages stand 1.1 octane numbers above a year ago on premium and 1.6 numbers higher for regular grade.

The survey for June of this year showed one city averaging 98 premium octane. None rated that high this month. But 46 cities showed 96 or higher, as compared with 40 a month ago, reflecting a general upward movement in the higher brackets.

Buffalo stood highest this month with a premium average of 97.8, and Salt Lake City showed the lowest rating with a 92.7 research octane number.

PREMIUM

	July 1956	June 1956	July 1955
90-90.9	0	0	1
91-91.9	0	0	1
92-92.9	1	1	1
93-93.9	1	1	5
94-94.9	2	3	13
95-95.9	3	7	13
96-96.9	21	18	17
97-97.9	25	22	2
98-98.9	0	1	0
Total cities	53	53	53
Wtd. avg. RON	96.9	97.0	95.8
Wtd. avg. TEL ml/gal.	2.60	2.58	2.57

Regular grade samples also showed the continuing trend toward antiknock improvement in the higher brackets, with 40 cities averaging 88 octane number or better, compared with 37 last month and 25 a year ago.

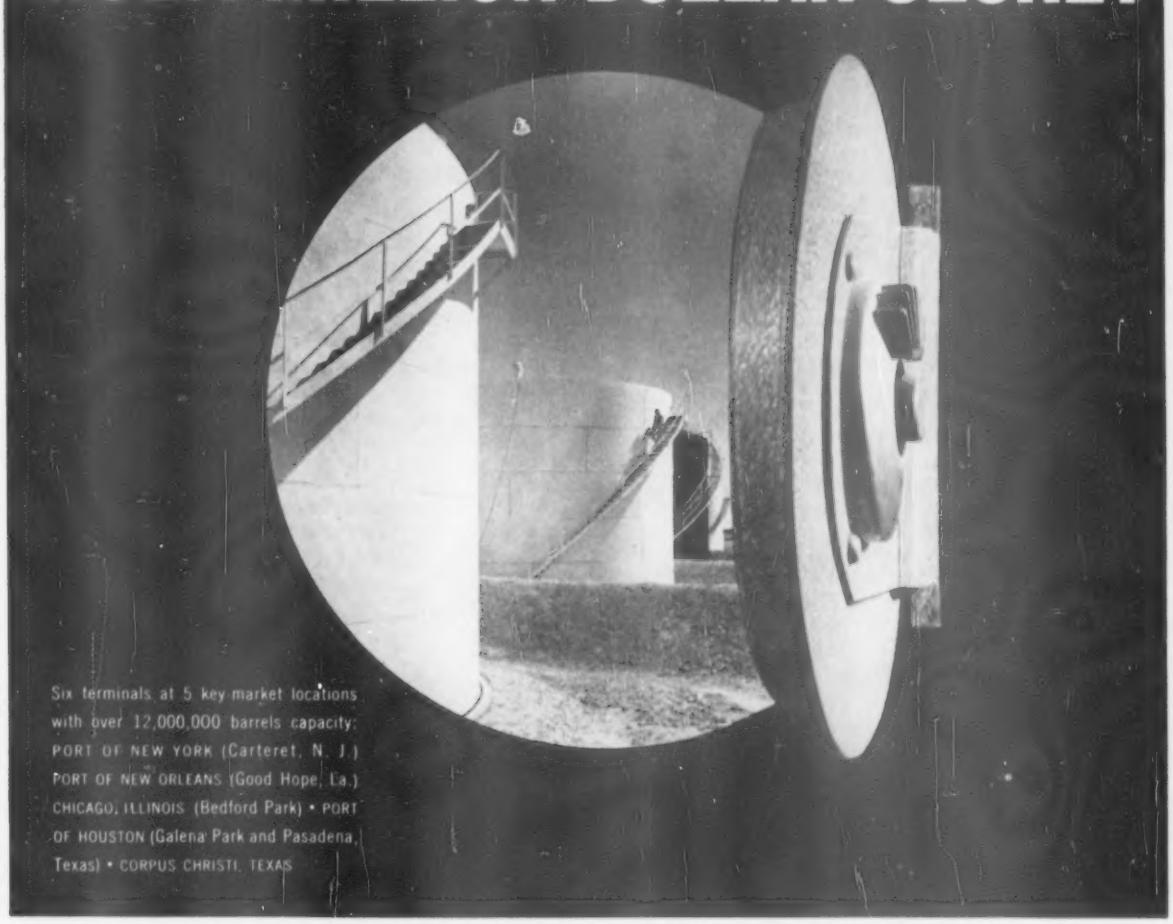
For regular grade, Pittsburgh showed the highest average, with 92.7, while Salt Lake City again stood at the bottom with 82.1 research octane number.

REGULAR

	July 1956	June 1956	July 1955
82-82.9	1	1	1
83-83.9	0	0	1
84-84.9	0	0	2
85-85.9	1	2	7
86-86.9	5	6	13
87-87.9	6	7	4
88-88.8	13	10	8
89-89.9	8	9	8
90-90.9	4	3	9
91-91.9	10	9	0
92-92.9	5	6	0
Total cities	53	53	53
Wtd. avg. RON	90.1	90.0	88.5
Wtd. avg. TEL ml/gal.	2.37	2.32	2.21

how to keep a

MULTI-MILLION-DOLLAR SECRET



Six terminals at 5 key market locations with over 12,000,000 barrels capacity: PORT OF NEW YORK (Carteret, N. J.) PORT OF NEW ORLEANS (Good Hope, La.) CHICAGO, ILLINOIS (Bedford Park) • PORT OF HOUSTON (Galena Park and Pasadena, Texas) • CORPUS CHRISTI, TEXAS

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Early Floods Get Help

Higher allowables to go to injection projects started early in a field's life. Expected result: More floods

AUSTIN.—The Texas Railroad Commission wants the industry to undertake more pressure-maintenance projects.

It has adopted a firm policy which will permit increases in allowables for such projects—up to the maximum permitted under its depth-classification formula.

It initiated the policy by approving allowable increases for the huge SACROC Unit (Kelly-Snyder field) and the Goldsmith San Andres project.

The precedent-setting action is expected to result in applications for pressure-maintenance projects in fields which might never have been flooded otherwise. Several projects have been planned for large fields but have not been undertaken for lack of economic incentive. The commission order should change this.

Kelly-Snyder and Goldsmith, prior to flooding, were more-or-less typical solution-gas-drive reservoirs. Reservoir pressures fell and gas-oil rates climbed alarmingly in their early years. Poor performance led the Railroad Commission to cut allowables of the fields several times to points far below yardstick for depth of the pays.

When water injection improved performance by stabilizing or raising pressures and cutting ratios, the units wanted allowables scaled back up. They argued that an operator couldn't afford to tie up millions of dollars to maintain pressure in a field if any economic benefit were to be put off until primary oil were recovered 30 to 40 years later.

Points against . . . The Railroad Commission debated the situation carefully and at length. In times of surplus production, as at the present, it has always been reluctant to take any action which might swell the surplus.

The thought was advanced that the commission should not reward operators "for not being bad boys." Another view was that the allowable-increase would be granted primarily on economic rather than conservation grounds. And, if it went along, the commission might eventually find itself granting allowables on basis of well costs.

Points for . . . There were more and weightier arguments, however, on the other side. For instance:

. . . Secondary floods, or so-called salvage operations started when primary production of a field is essentially depleted, are permitted to produce at capacity in Texas. This is so even when "capacity" is in excess of yardstick depth allowables. The commission offers this incentive to insure that operators will flood primary-depleted fields to keep from leaving recoverable oil in the ground.

It is accepted, however, that it is better conservation practice to start a flood earlier in the life of a field, that more oil eventually will be recovered this way than by waiting until the field is depleted.

Why then, the commission reasoned, should it penalize a pressure-maintenance project, while rewarding a salvage operation?

. . . It would seem unfair to penalize operators in a field such as SACROC or Goldsmith who had spent millions to effect an artificial water drive when operators in other fields continue to produce their full allowables merely because they were lucky enough to be in a field with a natural water drive.

. . . Denial of the higher allowables, for SACROC and Goldsmith, as argued by the two units, might well discourage operators in other fields from starting similar pressure-maintenance operations. If so, oil conservation in Texas would not be well served.

. . . Since allowables had been cut in the fields in the past to well below yardstick for inefficient production, the higher allowables could be regarded not as bonuses but as cancellations of penalties due to restoration of the fields to healthy status.

How it will be done . . . The commission is granting the allowable hikes on a basis whereby the units will get allowable credit for water injected over and above the volume of fluids (oil, gas, and water) produced.

The two big units get this credit in slightly different ways but the net result is the same.

SACROC will get 1 bbl. of added oil allowable for each 5 bbl. of water injected into the Canyon Reef after all fluids voided have been replaced with an equivalent volume of water.

Only wells, however, with a bottomhole pressure of 1,600 psi. or more and gas-oil ratios not over 1,000:1 can qualify for the bonus. The total bonus is further limited by rules which limit the injection allowable of any lease or unit to 25 per cent of the total allowable of that lease or unit and hold the top allowable for any one well to 400 bbl. per producing day.

The maximum bonus the unit could earn would be roughly 36,000 bbl. a day—about a 30 per cent increase. The initial increase will be much less than this, however, since pressure in many wells around the perimeter of the unit is still below 1,600 psi.

Goldsmith's San Andres Unit will get an initial allowable hike of about 10,421 bbl. daily, according to commission figures. This would raise the unit allowable from the old 16,250 bbl. daily to 26,671 bbl. daily.

With the bonus formula, the unit figures it could produce no more than 38,690 bbl. daily, the yardstick limit. The unit is not now injecting enough water to earn the maximum credit.

The allowable credit, under the Goldsmith formula, will be equal to net water input over GOR times gas-volume factor plus gas input over GOR minus basic allowable.

Under no circumstances shall the total Goldsmith San Andres Unit allowable exceed the yardstick (73 bbl. per well) times the number of wells in the field.

Shorter Week Eyed

O.C.A.W. may bargain for 36-hour week next winter

DENVER.—A proposed 36-hour work week in the oil industry, with no cut in take-home pay, will be submitted to the Oil, Chemical, and Atomic Workers International Union at its convention opening August 20 in St. Louis.

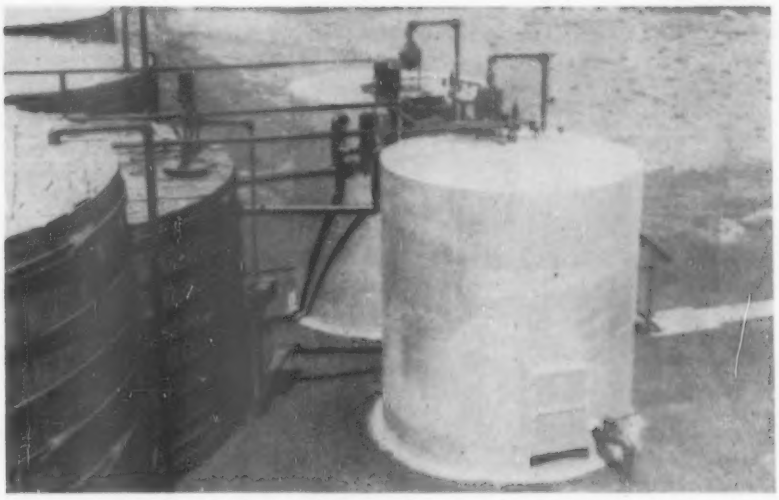
A resolution calling for such a program was adopted recently by O.C.A.W. District 4 Council at a meeting in New Orleans.

The proposal is expected to be studied first by the union's bargaining policy committee at a preconvention meeting August 17, also in St. Louis.

This 54-member committee annually establishes demands to be laid before the oil industry when new contract negotiations open in the fall, usually around November 1, in behalf of the union's 200,000 members.

An O.C.A.W. spokesman declined to speculate on the union's goals for 1957.

The union spokesman said he expected "nothing concrete" to come from the convention concerning proposed merger of the 80,000-member International Chemical Workers Union with O.C.A.W. A special committee named by delegates from each union has been exploring the merger proposal.



SILENT SALESMAN are these Gulf tanks in Kansas as . . .

Automatic Sales at Lease Prove Success

TULSA.—The industry's first automatic custody transfer system on a lease basis is starting its seventh month of successful operations.

Officials of Gulf Oil Corp. and Kaw Pipe Line Co. report they are well satisfied with the first 6 months' results of their installation. The automatic tank battery is operating on Gulf's Ames lease in Kansas *(The Oil and Gas Journal, April 23, page 96)*.

Gulf reports that as of July 1, a total of 32,189.13 bbl. of crude oil was run automatically. With the exception of the first month, the battery has operated on an unattended basis. In the first month, operations were watched closely.

One Gulf representative explained that so far "no mismeasurements have occurred and accuracy of the instruments has been well within the desired limits."

The Gulf-Kaw system went into operation last December 22 when exactly 216.76 bbl. of Arbuckle crude were automatically delivered to the gathering pipeline. The system delivers constant-gross-volume dumps from two alternating measuring tanks. In addition, temperature recorders, a dump counter, and a b.s. and water monitor to reject bad oil make up the basic battery equipment.

Although much research has been conducted into automatic custody transfer *(The Oil and Gas Journal, June 11, page 110)*, the Gulf-Kaw venture is believed the first time in oil history that crude has been sold automatically at the lease.

It was all a mistake . . .

Superpremium Price Fears Eased

HOUSTON.—Threat of a price war in the superpremium gasoline field eased last week.

An independent marketer admitted a "little error" had been made in announcing plans to sell 100-octane gasoline at the price he had been getting for 98-octane.

Watson Oil Co., which claims its 100-octane gasoline is "coming soon," has reappraised its price position. Indications are the third grade now will sell for 1 to 3 cents per gallon more than current premium.

Shell step-out . . . Meanwhile, Shell Oil Co. became the first major marketer to introduce a superpremium replacing the former premium grade.

Most Shell stations in the area were selling the new grade at about 32.2-32.7 cents, or 1 cent per gallon above Shell's former premium gasoline.

In introducing the new "Super Shell," the company has steered away from giving any direct octane rating, as have other marketers of superpremium motor fuel. Some Shell dealers have been telling the public that they understand the fuel is "better than 100 octane."

Company officials would neither confirm nor deny the reports. In full-page newspaper advertisements, Shell says "it is the most powerful gasoline the most powerful cars can use."

A company spokesman said the improved premium is in "direct competition" with third-grade gasolines recently introduced in this area by Humble Oil & Refining Co. and Continental Oil Co. Both Humble and Conoco are getting a 3-cent differential for the improved third grade.

Mistake in price . . . Ernest Watson, a partner in Watson Oil Co., said a mistake had been made in painting a service station sign advertising 100-octane gasoline at "no change in price" *(The Oil and Gas Journal, July 30, page 126)*.

Watson's superpremium gasoline, when introduced in the near future, is expected to sell for about 31 cents per gallon. This would maintain the traditional 1 to 2 cents differential between independent and major-company gasolines.

Rexformer Added

4,000-bbl. unit completed by Cosden at Big Spring

BIG SPRING, Tex.—A 4,000-bbl. Rexformer went on stream last week at Cosden Petroleum Corp.'s 28,000-bbl. refinery here. The unit, costing $2½ million, is the second Rexformer ever installed and the first one designed and built "from the ground up."

Aurora Gasoline Co. last month placed a 7,000-bbl. Rexformer on stream at its 42,000-bbl. Detroit refinery, but it was converted from a Platformer *(The Oil and Gas Journal, July 9, page 67)*.

Construction of the Cosden unit was completed in only 6½ months from the January 18 ground-breaking. It was built by Procon, Inc., a subsidiary of Universal Oil Products Co., which licenses the process.

Cosden's Rexformer will upgrade low-octane feeds to motor-fuel blending stock of 100-plus octane rating. The process involved is a combination of platinum-catalyst reforming and selective extraction.

The unit will release Cosden's BTX plant to full-time production of aromatic chemicals, increasing the refinery output of nitration-grade benzene, toluene, and xylene by 30 per cent.

Completion of the new unit is the latest phase of a comprehensive expansion and modernization program at the Big Spring plant.

Other facilities recently completed or under construction include a 2,100-bbl. Unifining unit, a $3,000,000 styrene plant, a $1,000,000 revamp of the plant's catalytic cracking unit, and a 100-mile products pipeline from the refinery to the company's terminal facilities at Abilene, Tex.

Bureau of Mines outlines plans . . .

Emphasis Is on Research

WASHINGTON.—A broad program of oil and gas research is being laid out by the Bureau of Mines for the current fiscal year.

Improved production methods will be a major objective of the bureau. Studies will be made to develop a better understanding of drilling fluids.

Laboratory search will seek the answer to the question of why certain oils tend to "stick" underground, resisting efforts to extract them. Tiny amounts of metals and other elements in oil may be major factors in this problem.

Laboratory and field tests of detergents will be continued on products which have shown promise in washing oil out of tight formations in secondary-recovery projects. Engineering studies will be made at a number of selected oil fields in various areas.

The bureau will study leakage and other problems encountered in storing natural gas underground. Further research will be run on transportation of oil and gas by pipeline.

Basic research on sulfur and nitrogen compounds will continue. The occurrence of these in crude oil causes refining difficulties. Additional information will be collected and published on characteristics of various crude oils. Factors affecting the stability of various fuels in storage will be studied further.

A "bomb" for diesels . . . Using a specially developed device called a "constant-volume ignition bomb," the bureau will continue to study the reactions that take place during combustion of diesel fuels.

This research is aimed at promoting more efficient use of diesel fuels and may eventually result in developing superior diesel equipment.

Experiments in mining and retorting oil shale at Rifle, Colo., have been discontinued. But the bureau will continue laboratory studies at Laramie, Wyo., to get more information on the nature and properties of kerogen, the organic material in oil shale, and the products that can be made from it.

The Rifle oil-shale plant has been taken over by Navy. It will be held in standby until the question of operating funds has been cleared up *(The Oil and Gas Journal, July 2, page 68)*.

The bureau's studies on helium will be continued. They will cover its occurence processing, production, transportation, and utilization.

Liquid fuels from coal . . . While the bureau has dropped its work on oil shale, it is continuing research on synthetic liquid fuels from coal. This will include hydrogenation tests, with analysis and characterization of the products obtained. Catalyst studies will provide data needed in producing synthetic liquid fuels by both the hydrogenation and gas-synthesis processes.

Work will be started at a newly equipped laboratory at the Morgantown, W. Va., experiment station on the properties and potential uses of tars produced by low-temperature carbonization of coal. These are now "orphan" products, but the studies could lead to establishment of a new industry.

The bureau also will conduct further tests in underground gasification of coal at Gorgas, Ala., during the year.

New Caverns Slated

Esso and Northern Illinois increase L.P.G. storage

TWO of the largest mined-rock caverns in the United States for storing L.P.G. will be constructed by Esso Standard Oil Co. and Northern Illinois Gas Co.

Esso plans to build the largest in the world at its Bayway refinery. Construction will begin this month and completion is scheduled within 18 months. It will have a capacity of 300,000 bbl.

Northern Illinois will build the third largest rock cavern near Chicago. It will rank behind the proposed Esso cavern and Phillips Petroleum Co.'s 260,000-bbl. project at Kankakee, Ill. Estimated cost is $1,000,000, which would be only $4.20 per barrel. Capacity is estimated at 238,000 bbl.

The liquid propane will be mixed with natural gas for use in peak-shaving operations during the days of heaviest demand in winter. Northern Illinois has 10 mixing plants. The new project would hold a volume of product equivalent to 900,000,000 cu. ft. of natural gas, or 2 days' supply in zero weather.

Esso will sink a 10-ft. shaft to 300 ft. From there tunnels will be mined in various directions. A 40-ft. bulldozer, dismantled for lowering down the shaft, will be reassembled underground and used in the excavation.

Northern Illinois will drill a 42-in. shaft to 250 ft. Conventional mining methods will be employed to excavate a 3,000-ft. system of tunnels 12 to 15 ft. wide and 30 ft. high. The company expects early approval of the Illinois Commerce Commission and plans to have the cavern ready to receive propane next summer.

Union Looks Abroad

150,000 Middle East oil workers are union target

A UNION organizing drive among 150,000 refinery and production workers in Egypt, Saudia Arabia, Syria, Lebanon, Iran, and Iraq is planned by the International Federation of Petroleum Workers.

"We've been observing and now are waiting for the appropriate time," said Loyd A. Haskins, general secretary of the Denver-based I.F.P.W., after returning from Egypt. President of the organization is O. A. (Jack) Knight, head of the Oil, Chemical and Atomic Workers International Union, also headquartered in Denver.

The I.F.P.W. will be aided in its campaign "with money and manpower" supplied by the International Confederation of Free Trade Unions, Haskins said.

C. H. Millard, Canadian director of the United Steelworkers Union and vice president of the Canadian Labor Congress, recently was named the first director of organization of I.C.F.T.U.

Haskins said Millard, who is responsible for global organizing activities among the I.C.F.T.U.'s 54,000,000 members in 81 countries, will concentrate his initial efforts among foreign petroleum and plantation workers.

In Egypt, according to Haskins, the country's 20,000 petroleum workers already are organized on the Petroleum and Chemical Federation, headed by Anwar Salama, an employe of Shell Oil Co. The P.C.F. now is conducting a major organizing drive among chemical workers. Only about 10 per cent are affiliated with the union.

Hall Sells Oil Interests

DALLAS. — General American Oil Co. of Texas last week bought interests in 31 oil wells in West Texas for $1,125,000 from G. E. Hall of Dallas and Midland, Tex.

The purchase involves 13½ net wells making about 45,000 bbl. of oil a month in Emma and Fuhrman Glorietta fields of Andrews County, Eaves field of Winkler County, Seminole field of Gaines County, and Old Glory field of Stonewall County.

Ten of the part-interest wells are in Emma, seven each in Eaves and Old Glory, three in Seminole, and four in Fuhrman Glorietta.

Consideration is reported to include part payment from future production.

Equipment Massed for Record Frac Job

MIDLAND.—A vast array of tanks, trucks, and line equipment was concentrated at the well site on an arid prairie near here when Dowell Incorporated performed its record fracture treatment.

The jam around the Hanley Co.'s A-2 Driver well is graphically shown in the photograph above.

The treatment consisted of 250,000 gal. of fresh water and 200,000 lb. of sand. Pump trucks put the mixture into the well at 52 bbl. per minute using 4,500 hydraulic horsepower to work against the pressure of 3,400 psi. Top of the treated formation was 7,767 ft.

Dowell termed the fracture job the biggest ever undertaken *(The Oil and Gas Journal, July 30, page 123)*. Previous record was a 100,000-gal. water-injection job in McCamey field.

Jersey Pulls New Midwest Deal

CHICAGO.—Standard Oil Co. (N. J.) is making its second move in a drive to win a big share of the Midwest markets.

The company is completing a deal to buy South Side Petroleum Co., Inc., and the affiliated Oklahoma Oil Products Corp., which have bulk stations, terminals, and retail outlets in Chicago.

The move bears out predictions made when Jersey entered the area for the first time 2 months ago with the purchase of Pate Oil Co., Milwaukee, a large jobber and retailer *(The Oil and Gas Journal, June 11, page 87)*. Pate has been moving 50 million gallons of products a year, including 33 million gallons of gasoline, through 140 service stations and two bulk plants.

These two deals are expected to be only the beginning. It's reported that Jersey is negotiating for Perfect Power Co., another Chicago jobber and retailer. Perfect Power is headed by G. G. Woodruff, who is widely known in the marketing end of the oil business.

What Jersey bought . . . South Side carries out terminal, blending, and bulk-station operations while Oklahoma Oil handles retail sales. Oklahoma Oil has large gallonage through 75 retail outlets, most of them of the superstation type.

It undersells the major companies, issues prizes, and does extensive newspaper and television advertising. This aggressive sales program gives the company one of the biggest volumes per station in the area.

Joseph Guilbault is president, general manager, and a large stockholder in the purchased companies. Another large stockholder is I. A. O'Shaughnessy, a long-time associate of the head of Perfect Power and president of Globe Oil & Refining Co.

Oklahoma Oil is supplied products by Pure Oil Co.'s 45,000-bbl. Lemont, Ill., refinery purchased from Globe in 1954. The deal is understood to involve a processing arrangement with Globe, which has producing and marketing interests.

Globe recently completed a large terminal at Willow Springs, Ill., enabling it to receive water deliveries up the Mississippi River. This property is not involved in the Jersey deal, according to present reports. But it could be used in Jersey's new operations.

Industry BRIEFS

AUSTIN. — The board for lease of University of Texas lands has decided to hold another sale of oil and gas leases on university lands early in December. Operators are being asked to notify the board of tracts they would like to lease in order of preference.

OMAHA. — Permian Basin Pipeline Co. will double the capacity of its Andrews gasoline plant in Andrews County, Texas, with the addition of five 1,350-hp. compressor units. The company is taking 25,000,000 cu. ft. of natural gas daily from Phillips Petroleum Co. It will boost this to 50,000,000 cu. ft. with addition of the new facilities.

PITTSBURGH.—Plymouth Oil Co. has purchased the remaining 25 per cent stock interest in Big Lake Oil Co. from Continental Oil Co. Big Lake will be absorbed by Plymouth. Organized in 1923, Big Lake opened up the first major discovery field in the Permian basin of West Texas.

PRESTON, Idaho.—Rosegold Uranium Corp. has entered the oil business. The recently reorganized San Francisco firm is scheduled to stake three wildcats in the southeast corner of Idaho. The first one is due to spud in this month on a 1,000-acre Arimo-structure lease 6 miles south of here. The other two will be on the Benida and Kohler Hills structures.

Rosegold's president, John O. Maberry, is former corporation commissioner and assistant oil and gas umpire for Oklahoma. He also is a former assistant manager of Western Gulf Oil Co. in Los Angeles.

WASHINGTON.—The Federal Power Commission has granted temporary authority to Mountain Fuel Supply Co. of Salt Lake City to build pipeline facilities enabling it to take 58,750,000 cu. ft. of natural gas daily from Pacific Northwest Pipeline Corp. Mountain Fuel will build 38 miles of pipeline, 2,640-hp. in compressor capacity, and an interconnection with Pacific Northwest's system in Sweetwater County, Wyoming, to take delivery of the gas.

MOAB, Utah.—Red Hill Uranium Corp. is negotiating for 81 producing oil wells in Montana. President Jack Turner said the proposed transaction involves about 100,000 acres of Montana oil leases. Red Hill has 12,000 acres in New Mexico and 2,880 acres in Colorado.

Foreign Output Still Up

Oil production from free-world areas hits record, widens gap over U. S. output which declines second straight month

THE gap in crude production between the United States and other free-world countries widened in May.

Foreign output increased its lead over domestic by rising to a record high, while U. S. production declined for the second month.

Total foreign production averaged 7,797,200 bbl. daily, a gain of 106,400 bbl. daily over April. This level was 733,200 bbl. daily greater than U. S. output of 7,064,000 bbl.

Domestic output was down 82,000 bbl. daily. This was the lowest since November.

The net gain in free-world production was 24,400 bbl. daily, bringing total output to 14,861,200 bbl. daily.

Middle East grows . . . The Middle East was the area showing the greatest overall increase. Production rose 57,300 bbl. daily to a record high of 3,793,900 bbl. daily.

Production in Iraq averaged 715,300 bbl. daily, a gain of 37,500 bbl. daily, or 5.5 per cent over April. The output was the highest in 5 months.

Arabian American Oil Co. produced more oil than ever before in Saudi Arabia. The average of 1,121,300 bbl. daily was a gain of 67,200 bbl. daily, or 6.4 per cent over April. The previous high record had held since May 1955.

The Saudi 5-month average was 1,039,900 bbl. daily, an increase of 83,900 bbl. daily, or 8.8 per cent, over the same period last year.

Some declines . . . Two producers recorded declines during the month. Iranian output totaled 560,000 bbl. daily, a decline of 16,000 bbl. daily. The decrease was the first in 6 months.

Production in Kuwait was off 35,200 bbl. daily from the record previous month to 1,207,000 bbl. daily. By coincidence, output was within 900 bbl. daily of May 1955 production which had stood as a record for 11 months.

Companies operating in Venezuela produced 2,348,600 bbl. daily, a gain of 34,900 bbl. daily over a previous month. However, output was lower than in February or March.

Smaller producers . . . Among the smaller producing countries, Chile's government monopoly, Empressa Nacional de Petroleo (ENAP), appeared well on its way toward achieving a hoped-for increase of 31 per cent over 1955 production of 7,100 bbl. daily. The May average of 9,300 bbl. daily equalled the 1956 goal.

In Austria, no time was lost in putting the country's newest discovery into production. The 1 Puchkirchen, located in the Alpine foothills, averaged 43 bbl. daily its first month.

The well was drilled by R.A.G., jointly owned by Socony Mobil Oil Co., Inc., and Royal Dutch-Shell. It produced 34°-gravity crude from a 6-ft. section at about 7,750 ft. The gas-oil ratio was 187:1.

TREND OVER THE LAST YEAR

1955—	Western Hemisphere less U.S.	Middle East	Total, non-Communist countries
May	2,937.4	3,282.5	6,739.1
June	3,019.7	3,201.6	6,720.9
July	3,092.7	3,275.8	6,872.1
August	3,140.4	3,243.0	6,978.2
September	3,130.9	3,256.9	6,990.7
October	3,179.6	3,378.2	7,166.0
November	3,255.0	3,386.0	7,248.3
December	3,298.5	3,316.1	7,227.2
1956			
January	3,363.7	3,392.6	7,368.5
February	3,426.2	3,415.7	7,453.4
March	3,471.2	3,624.3	7,713.8
April	3,320.5	3,736.6	7,690.8
May	3,366.4	3,793.9	7,797.2

World-Wide Crude Production

(Daily average in thousands of barrels)

Country—	May 1956	April 1956	May 1955
W. Hemisphere:			
Argentina	84.0	84.0	82.0
Bolivia	8.2	8.2	7.4
Brazil	7.0	6.7	4.6
Canada	399.0	395.9	313.3
Chile	9.3	9.2	6.5
Colombia	118.0	118.9	106.5
Cuba	1.6	1.6	1.1
Ecuador	9.8	9.8	9.2
Mexico	255.0	247.0	255.0
Peru	48.9	48.9	45.4
Trinidad	77.0	76.6	65.2
Venezuela	2,348.6	2,313.7	2,041.2
Total	3,366.4	3,320.5	2,937.4
W. Europe & Africa:			
Algeria	0.7	0.7	1.2
French Moroco	2.2	2.2	2.3
Egypt	38.2	38.2	32.9
Austria*	64.7	64.7	
France	23.5	23.8	16.5
West Germany	67.8	66.5	60.4
Italy	10.6	9.0	3.7
Netherlands	20.6	20.1	19.4
Turkey	5.5	5.5	3.0
United Kingdom	1.2	1.2	1.0
Yugoslavia	5.5	5.4	5.0
Total	240.5	237.3	145.4
Middle East:			
Bahrain	30.0	30.0	30.0
Iran†	560.0	576.0	285.0
Iraq‡	715.3	677.8	678.7
Israel	0.6	0.3	
Kuwait	1,207.0	1,242.2	1,207.9
Neutral Zone	30.0	30.0	23.0
Qatar	129.7	126.2	114.2
Saudi Arabia	1,121.3	1,054.1	943.7
Total	3,393.9	3,736.6	3,282.5
Other Asia:			
British Borneo	115.0	115.0	107.2
Burma	5.2	5.2	4.3
India	7.5	7.5	6.0
Indonesia	250.0	250.0	235.5
Japan	6.0	6.0	6.0
New Guinea	7.0	7.0	9.3
Pakistan	5.7	5.7	5.5
Total	396.4	396.4	373.8
Total, Free World Foreign	7,797.2	7,690.8	6,739.1
United States	7,064.0	7,146.0	6,677.0
Total Free World	14,861.2	14,836.8	13,416.1
Communist Countries in Soviet Orbit:			
Russian Zone of Austria*			68.2
Romania	150.0	150.0	125.0
Russia	1,500.0	1,500.0	1,235.0
Others	50.0	50.0	36.8
Total	1,700.0	1,700.0	1,465.0
World total	16,561.2	16,536.8	14,881.1

*Austria took over its producing fields from Russia in August 1955.

†Includes estimated 4,000 bbl. daily from Naft-i-Shah field not operated by consortium companies

‡Includes estimated 3,800 bbl. daily this year and 12,000 bbl. daily in 1955 from Naft Khaneh field, operated by British Petroleum Co., Ltd., rather than I.P.C.

Figures are from reliable reports in the industry or official government sources. Data for Russia and eastern Europe are based on competent estimates; no authentic information is available on month-to-month production in these areas. Estimates also have been made for other countries, particularly in Southeast Asia, where complete current reports are lacking. Communist countries in the Soviet orbit includes satellite countries in Europe and Red China.

Desert Shows Reported

Three wildcats, among rankest in Eastern Hemisphere, are sparking wide interest in Libya and Arabia areas

REPORTED or rumored oil shows in three of the Eastern Hemisphere's rankest wildcats sparked industry interest last week, but operators of the desert wells were inclined to minimize the shows or deny them outright.

The shows were reported from widely separated areas on the southern Arabian Peninsula and from Libya in North Africa.

Cities Service Co. officials last week conceded they have had a slight oil show in the second well of a joint operation with Richfield Oil Co. in Dhofar, on the southern edge of the Arabian Peninsula. Cities Service discounts any major significance in the show, encountered at about 1,900 ft. in Marmul 1.

The show was not regarded as important enough to test, but even a "slight show," as Cities Service calls it, is significant in the previously untested area. The well had lost circulation troubles about 200 ft. deeper, but last week was drilling ahead at below 4,800 ft.

Marmul 1 is about 80 miles almost due east of the first test drilled in Dhofar, Dauka 1. It was abandoned at 11,700 ft. The surface exploration work being carried on by the company in conjunction with the drilling operation has been suspended until October weather moderates the desert heat enough to allow crews to work. Cities Service has had one gravity and one seismic crew at work.

Oman . . . In the neighboring sultanate to the east, Oman, there were unconfirmed rumors last week that Petroleum Development (Oman), Ltd., an associate of Iraq Petroleum Co., Ltd., has had a similar slight show in its remote desert wildcat at Jebel Fahud.

The company spudded its well in the almost uninhabited interior of Oman late last year after airlifting much of its equipment into the windswept and waterless wilderness *(The Oil and Gas Journal, December 12, 1955, page 78).*

The last definite report from the wildcat location was that the well was shut down for a fishing job after split casing trouble. At that time the well was drilling below 4,200 ft.

Libya . . . Half a continent away in North Africa, the first wildcat in a widespread and intensive exploration program in Libya was drilling in the Cretaceous below 4,000 ft.

The well, Libya's first, is being drilled by Libyan American Oil Co. (Texas Gulf Producing Co.) on promising acreage the company obtained in northern Cyrenaica east of Bengasi. Seven other companies have acreage in the highly regarded region and the well is being watched with a great deal of interest.

Gordon W. Reed, chairman of Libyan American's parent company, last week laughingly denied the rumors that the well had a promising show at 3,700 ft. The Libyan well was spudded in quietly this spring after company officials promised to start the first well drilled in the country after the Libyan Government granted acreage to a dozen companies early in the year.

Since Libyan American obtained the acreage, the international chemical, transportation, and banking firm, W. R. Grace & Co., has purchased a 40 per cent interest in the North African concession. Grace later bought 50,000 shares of Texas Gulf Producing *(The Oil and Gas Journal, May 28, page 105 and June 18, page 133).*

Lake Docks Planned

Creole will build mammoth new terminal in Maracaibo

CREOLE PETROLEUM CO., Venezuela's largest single crude producer, will build a $17-million marine loading terminal in Lake Maracaibo that will accommodate tankers up to 60,000 tons.

Located about 700 ft. offshore from Creole's present terminal at La Salina, the new facility will consist of a man-made island 2,985 ft. long and 1,968 ft. wide with two 1,250-ft. loading piers. Almost 160,000,000 cu. ft. of sand will be dredged from the lake to form the island. It will be encircled with concrete piling.

A look to future . . . The terminal will have a storage capacity of 3,144,000 bbl. of crude in four floating-roof steel tanks with 286,000 bbl. capacity each and two underground concrete and clay tanks with 1,000,000 bbl. capacity each.

Each of the two piers, already under construction, will handle two loading berths for tankers. The anticipated loading rate for each tanker is 40,000 bbl. an hour. Contract for design of the terminal has been let to Pipe Line Engineering Co., Dallas. The entire project is expected to be completed in 1957.

Construction of the new loading facilities has been planned since dredging operations began to open the Lake Maracaibo ship channel to ocean-going tankers. The channel was opened this spring after a 2¼-mile breakwater was built to prevent the channel at the mouth of the lake from refilling with silt *(The Oil and Gas Journal, December 26, 1955, page 100, and June 4, page 76).*

The maximum tonnage capacity planned by Creole is looking to the future. The lake channel will only accommodate 18,000-ton tankers now, but it is being enlarged to take care of bigger vessels. Eventually, dredging operations will enlarge the 20-mile waterway enough to take the largest tankers in use.

New Gas Show for Pakistan

A second gas show in East Pakistan has been encountered just a little more than a year after the region's first promising test blew out at Sylhet and destroyed a rig and all the drilling equipment.

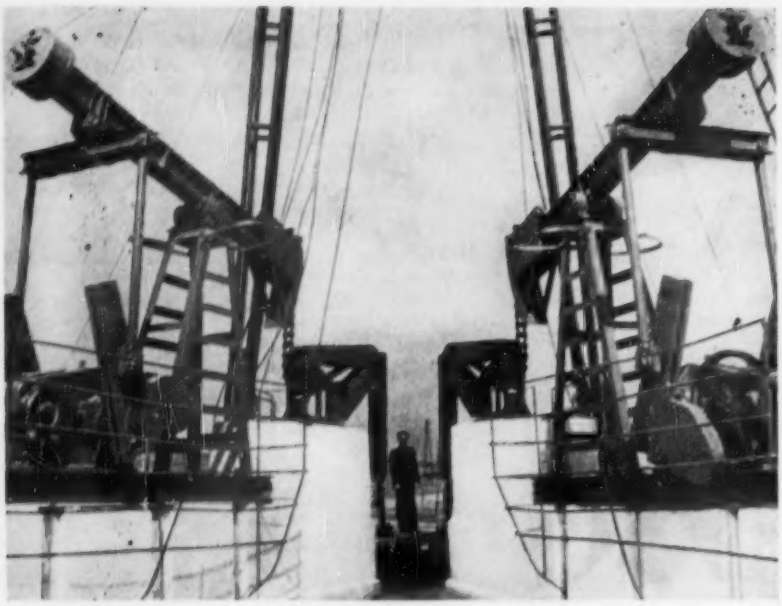
Pakistan Petroleums, Ltd. (owned 70 per cent by Burmah Oil Co., Ltd., and 30 per cent by the Pakistan Government) encountered a gas show at 4,380 ft. in Sylhet 2. The Sylhet 1 blew out and ignited when it encountered high-pressure gas at 7,800 ft. a year ago in June *(The Oil and Gas Journal, June 13, 1955, page 145).*

Company officials said in Karachi that it has not yet determined if the show might indicate commercial quantities of gas. The well is drilling ahead to test deeper horizons for both oil and gas. The second test is being drilled with a rig rated to 16,000 ft. The rig lost in the blowout last year was lighter.

Jersey to Explore Denmark

Standard Oil Co. (N.J.) is negotiating with the Danish Government to take over the exploration concessions now held in Denmark by Gulf Oil Corp.

Gulf's efforts there since the end of World War II have proved fruitless and, according to Danish reports, have cost almost $10 million. Jersey Standard is reportedly offering to spend another $5 million on the concession before it expires in 1960.



For faster penetration . . .

. . . Reds Use Multibore Drilling

RUSSIAN engineers claim they are increasing penetration rates and achieving more efficient use of drilling equipment by multibore drilling in mountainous areas and where water barriers hamper exploration and development.

The Russian technique is to drill two or more holes directionally from the same derrick floor using turbodrills. One writer in a Soviet scientific bulletin gives this description of the method:

"The more effective use of equipment achieved in multibore drilling is obtained through combining a number of operations. Thus, while a worn bit is being raised from one well, a bit is being lowered into another. While cement is setting or a bit is being changed, or the curvature of a directional hole is being measured at one well, drilling goes on at another bore whose opening is 5 ft. away."

Drilling speeds . . . Especially good reports on multiple-well drilling have been received from the Zolny field in the Stavropol district of Kuibyshev province and from Dagestan on the Caspian Sea north of Azerbaijan. The Soviet bulletin cites these figures:

At Zolny, the average monthly drilling speed for single-bore wells is 1,187 ft. per rig, compared with 1,588 ft. monthly for each rig drilling more than one well. Average time per well completion on single holes is 3.7 months, against 2.8 months for multiple wells. (Average completion depths are believed to be 4,392 ft. for single bore wells and 4,746 ft. for multiple-bore wells.)

In Dagestan, the average monthly drilling speed for single-bore wells is 1,640 ft. per rig, compared with 2,257 ft. for rigs handling more than one well at a time. Average period per well completion on single holes is 2 months and 1.5 months for multiple wells. (Average completion depths are believed 3,280 ft. for single-bore wells and 3,386 ft. for multiple-bore wells.)

The Soviet bulletin says that from 1950 through 1955, Russian crews made more than 300,000 meters (984,000 ft.) of hole by the multibore method. It adds that in fields where there are several producing zones, one rig may drill four or six wells at the same time.

Omissions . . . The bulletin did not say what formations the Zolny and Dagestan drillers were penetrating nor offer any explanation for the drilling speeds which are considerably lower than those achieved in the U. S. Also omitted was whether the wells were wildcats or development.

Last year, A. T. Shmarev, chief of the U.S.S.R.'s Tatar Republic Oil Administration, admitted that average Russian drilling speeds are much slower than those in the U. S. Average monthly drilling speed for Russian operational wells in 1955 was 2,985 ft. and the goal for exploratory wells by 1960 is only 1,968 ft. per month.

Egypt Stock Sold

California firm pulls out of Sinai Peninsula venture

SOUTHERN CALIFORNIA PETROLEUM CORP. of Los Angeles has sold all its interest in International Egyptian Oil Co., Inc.

Majority interest in the company, which is developing Belayim and Feiran fields in Egypt's Sinai Peninsula, is shared by Cie. Financiere des Petroles (Petrofina) and Azienda Generale Italiana Petroli (A.G.I.P.), the Italian Government oil company. Swiss banking interests own the remainder.

The American company acted as operator of the fields until early this year when Petrofina took over. Camdrill International, Inc., a subsidiary of Southern California Petroleum, was given a 2-year drilling contract in the operation.

Shortly afterward, the American company sold 33,332 shares of its stock in International Egyptian, presumably to Petrofina and A.G.I.P.

Last week, Tyler Woodward, president of Southern California Petroleum, disclosed that his company sold its remaining 50,000 shares.

Woodward did not disclose the buyer, but Petrofina last week told its shareholders it has increased its interest in the operation.

Camdrill is operating two of the five rigs now active in Belayim field. The field's production last month was about 7,000 bbl. daily and is expected to reach 20,000 bbl. daily by the end of the year.

Norwegian Refinery Planned

Standard Oil Co. (N. J.) has asked the Norwegian Government for approval of its plan to build a 40,000-bbl. refinery in southern Norway.

Jersey Standard officials in this country will say only that the plan is in the negotiating stage and has been for several months. Norwegian sources report the company wants to build the refinery at Skjerbergkilen on the east side of the Oslo Fjord. The location is about 70 miles south of Oslo and 20 miles from the Swedish border near Moss and Halden.

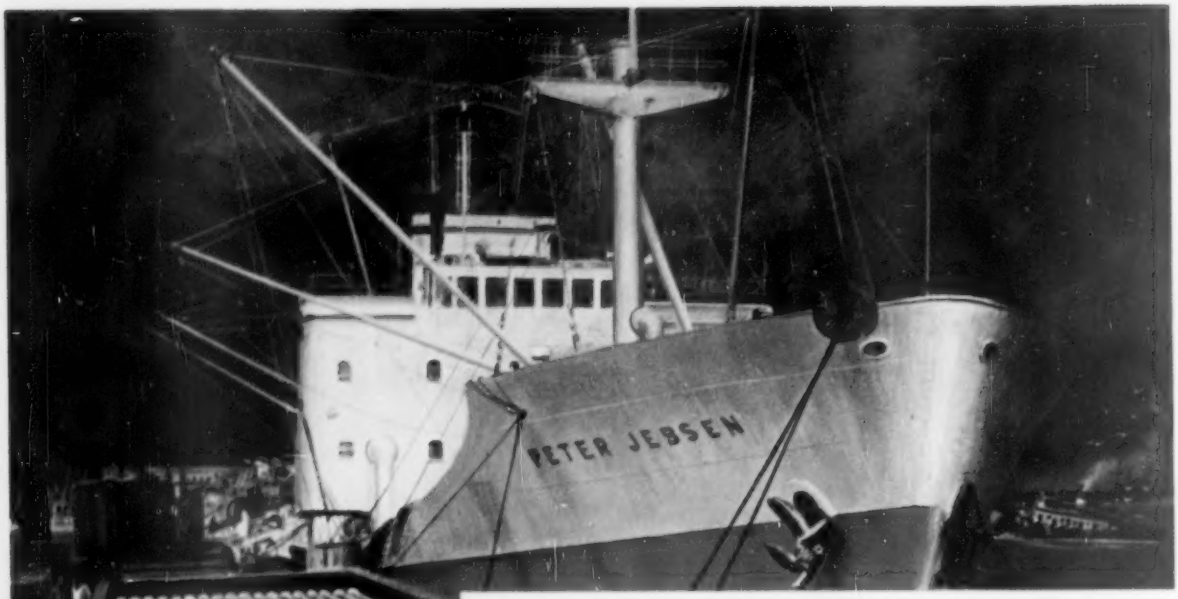
At this location, on the North Sea, products from the refinery could easily be transported to all the Scandinavian countries.

If the Norwegian Government gives its approval, the refinery will be the fourth new and major refinery construction project on the boards for Jersey Standard companies in Europe.

the "bit line" to your rig...

Every working day, big transport trucks like these load rock bits at our plant warehouse for delivery to more than 150 Hughes field stockpoints throughout the United States and Canada. The final destination — your rig!

In maintaining these ample stocks, Hughes Tool Company's high capacity production lines operate 'round the clock, 'round the year. As a result, the bits available for delivery to your rig are always *right* as to size, type and design for your drilling requirements.



More "Flash-Weld" joints from Hughes are going overseas

The proved *economy* and *dependability* of Hughes "FLASH-WELD" tool joints is resulting in their increased use overseas. And here is why:

1) Hughes' hardfaced "FLASH-WELD" joints last the life of the drill stem — *don't have to be replaced*. And they may be safely rehardfaced in the field.

2) Hughes' "FLASH-WELD" joints eliminate the burden of replacement inventory, also the duty and cost of transporting and handling extra joints.

3) The highly specialized machines and processes pioneered and developed by Hughes exclusively for flashwelding tool joints to pipe assure a superior, more dependable drill stem.

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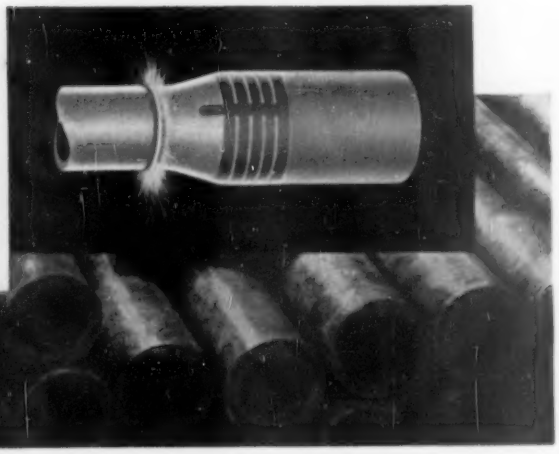
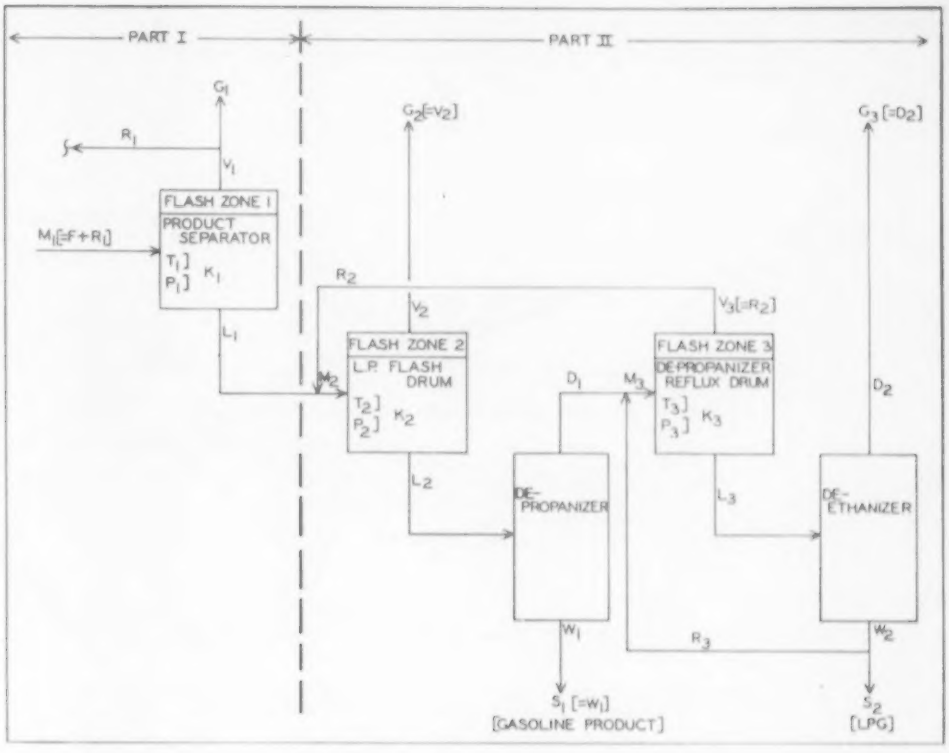




SIMPLIFIED FLOW DIAGRAM of cat reformer gas plant. Fig. 1.

Data analysis made quickly when . . .

Computers Optimize Gas-Plant Operation

by E. V. Merrick

THE process engineering division, Standard Oil Co. (Ohio), has employed an I.B.M. 650 electronic computer to optimize operation of the catalytic-reformer gas plant at one of Sohio's refineries.

Engineers used the machine to make performance calculations on the gas-plant operations at design conditions and at operating conditions bracketing design values.

Results show that:

- Time for the study took less than 61 hours of machine operation. This contrasts with an estimated 6,000 man-hours using a standard desk calculator.
- Increased product value was obtained by decreasing the low-pressure flash-drum temperature, increasing the depropanizer pressure, and decreasing the propane recycle rate. Effects of other variables were also quantitatively determined.
- Data from the study are helpful in determining design conditions for other gas plants, and in making design revamps on the gas plant studied.

Author is with Standard Oil Co. (Ohio), Cleveland. Article presented at W.P.R.A. meeting, Toledo, 1956.

Much data needed . . . In analyzing the problem, it was apparent that a tremendous amount of data would have to be calculated to supplement the few plant tests that were on hand. Further, the scope of the data to be calculated was too great to endeavor by hand, slide rule, or desk calculator. Neither the time nor the manpower were available to manage this.

Our engineering divisions have used electronic data processing machines in the past to eliminate paper work. In this particular case, it was believed the tremendous amount of information obtainable justified programing this problem on a computer.

The problem . . . This is illustrated by Fig. 1, a simplified flow diagram of the unit. It was designed to produce both a gasoline product (catalytic reformate) and a heating product (L.P.G.), each of a desired quality and yield at the design operating conditions.

If these operating conditions are varied, the composition and quantity of recycle streams change. Then, it becomes necessary to calculate these products obtained under the new conditions to see if they are still within the quality and yield range desired.

EQUILIBRIUM CALCULATIONS

$$\frac{K_i M_i}{L/V^* + K_i} = v_i \qquad [1]$$

$$\sum_{1}^{n} v_i = V \qquad [2]$$

$$\frac{M - V}{V} = L/V^* \qquad [3]$$

R_1 DETERMINATION

$$R_1^1 = \frac{\sum_{1}^{n} v_i}{v_1}\text{—————}[r_1] \qquad [4]$$

WHERE—

- M = TOTAL MOLS/HR. OF FEED $(F[\text{OR } L]+R)$
- M_i = MOLS/HR. OF EACH COMPONENT IN FEED
- v_i = MOLS/HR. OF EACH COMPONENT LEAVING FLASH ZONE AS VAPOR
- K_i = EQUILIBRIUM FACTOR FOR EACH COMPONENT IN FEED AT THE CHOSEN TEMPERATURE AND PRESSURE
- V = TOTAL MOLS/HR. OF VAPOR IN EQUILIBRIUM
- L = TOTAL MOLS/HR. OF LIQUID IN EQUILIBRIUM
- v_1 = MOLS/HR. HYDROGEN IN V_1
- r_1 = MOLS/HR. HYDROGEN IN R_1 [SPECIFIED]

* ASSUMED VALUE

EQUATIONS used to calculate vapor and liquid products at the product separator. Fig. 2.

"It was estimated to take an engineering assistant approximately 3 years, 6,000 hours, to obtain by hand the results that the 650 has given for this problem. In contrast, the 650 machine time totals less than 61 hours."

The problem involves the calculation of the yield and quality of these products. Initially, a feed stream, M_1, is taken into the first flash zone. This feed consists of a known quantity and composition of product, F, from the reactor (not shown here), and an assumed quantity and composition for recycle, R_1, as dictated by a fixed-hydrogen requirement in R_1. The composition of F will vary according to the degree of hydrocracking used in the reactor section.

The vapor and liquid products (V_1 and L_1) at the product separator are then calculated through the use of Equations 1, 2, and 3 of Fig. 2. The total recycle quantity R_1^1 is determined by the use of Equation 4 and compared with assumed R_1. If not equal, R_1^1 is used as R_1, with a composition proportional to V_1, and the calculation is repeated through the product separator.

Upon obtaining a balance between the equilibrium in the products separator and R_1, you then proceed to calculating the rest of the unit.

Flash-zone calculations . . . The equilibrium calculation through the remaining two flash zones is, of course, the same. However, the balancing of products in the unit after Flash Zone 1 is complicated by the interdependence of R_2 and R_3, whose quantities and compositions are assumed initially, and V_3 calculated: these calculations must then proceed until the calculated R_2 and R_3 are constant quantities for each set of operating conditions so that R_2 equals V_3.

This is simply a voluminous arithmetic problem largely repetitive in nature, with a trial-and-error approach used in assuming initial recycle quantities (R_1, R_2, and R_3). This is followed by equilibrium calculations in three sections of the plant—the products separator, the L.P. flash drum, and the depropanizer reflux drum. Material balance calculations are made at the depropanizer and at the deethanizer. Here empirical equations are used, based on design conditions (Fig. 3).

Programing . . . The problem was programed in two parts:

1. Calculations through the product separator section.
2. Balance of the plant—the calculations being continued upon a basis of selected results from the Part 1 calculations.

A total of 60 cases were calculated for Part 1 and then studied. The optimum temperature and pressure were selected for the product separator and incorporated into Part 2 as constants.

In order to evaluate the remaining variables completely, it was necessary to calculate a total of 729 cases in Part 2. For example, at the L.P. flash drum a range of three temperatures and three pressures was used. At the depropanizer reflux drum a range of three temperatures and three pressures also was used. The propane recycle rate (R_3) was taken at three percentage levels of the deethanizer bottoms rate.

The machine calculated all possible

EQUATIONS USED IN D_e-C_3 AND D_e-C_2 SECTIONS:

$$D + W = L = L_1 + L_2 \text{-----} L_n \qquad [5]$$

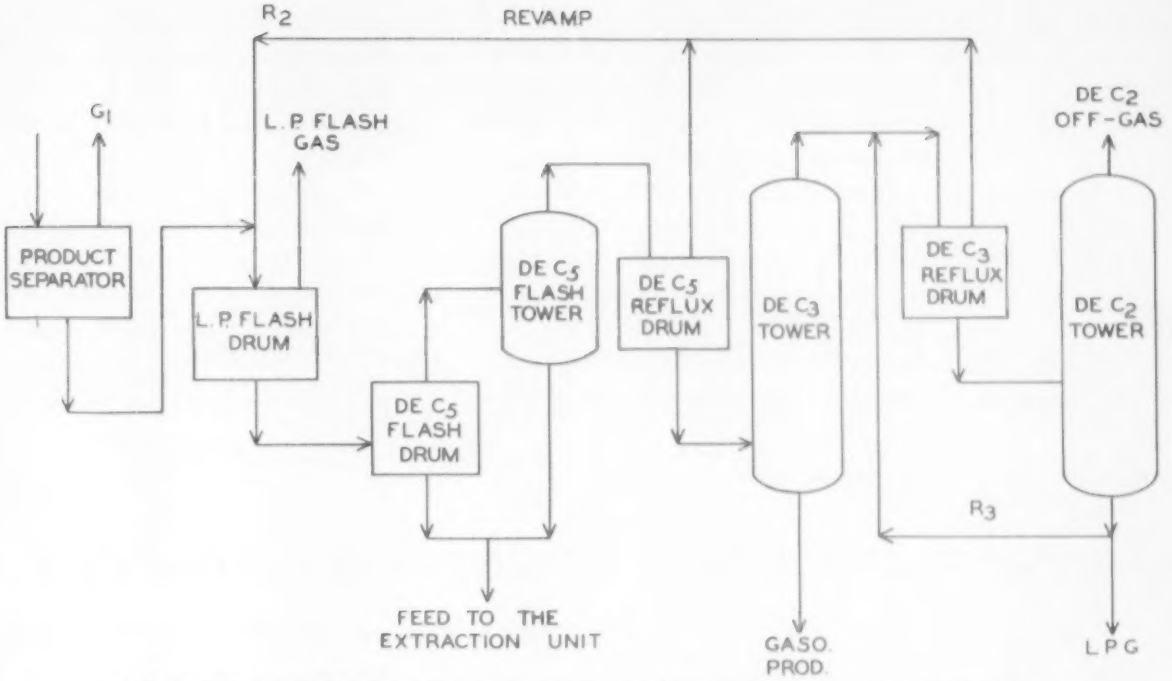
$$D = a_1 L_1 + a_2 L_2 \text{------} a_n L_n \qquad [6]$$

$$W = b_1 L_1 + b_2 L_2 \text{------} b_n L_n \qquad [7]$$

WHERE—

- D = OVERHEAD PRODUCT
- W = BOTTOMS PRODUCT
- L_i = MOLS/HR. OF EACH COMPONENT IN FEED
- a_i, b_i = DESIGN CONSTANTS, $a_i + b_i = 1$

EMPIRICAL EQUATIONS used for material balance calculations made at the depropanizer. Fig. 3.



ONE OF THE SCHEMES PROPOSED for revamping a gas plant to provide feed for an extraction unit. Fig. 4.

combinations of these operating conditions.

In essence, the machine program for this problem simulated the gas plant. It is interesting to note that the block diagram of the machine program could be superimposed on the gas plant flow diagram of Fig. 1.

Part 1 of the machine program used 422 instructions, 5 constants, and a working area of 110 locations. A total of 60 cases were computed in 39 minutes. The number of cases depended on variations in T_1, P_1 and F, (Fig. 1).

Part 2 used 599 instructions, 13 constants, and a working area of 195 locations. It is estimated that the I.B.M. 650 machine went through more than 75,000,000 operations to compute Part 2. A total of 729 cases was computed in approximately 60 hours. The number of cases depended on variations of T_2 and P_2 and T_3 and P_3, and L_1 and R_3.

Few difficulties . . . There were no programing difficulties once the problem was defined. Some minor scaling problems, discovered in testing the program, were quickly solved. Five decimals were used throughout the problem wherever possible, so that accuracy was maintained to a finer degree than possible by hand calculations. (Material balances checked within 0.01 per cent.)

The problem analysis and programming totalled approximately 425 manhours. The job breakdown for this total is as follows:

	Per cent
Problem analysis	19
Discussion and review	18
Block diagram	6
Coding	23
Checking of routines	20
Program testing on I.B.M. 650 machine	14

It was estimated to take an engineering assistant approximately 3 years, 6,000 hours, to obtain by hand the results that the 650 has given for this problem. In contrast, the 650 machine time totals less than 61 hours.

Results of studies . . . Our engineers studied all these calculated results in correlation with each other and with operating costs and product values. They then recommended the optimum operation of the gas plant to yield maximum propane recovery and gasoline product at minimum operating costs.

In correlating the effects of variables toward making these recommendations, they found that increasing product value could be obtained by:

1. Decreasing the L.P. flash drum temperature. (Pressure effect was negligible.)

2. Increasing the depropanizer pressure. (Temperature effect was negligible.)

3. Decreasing the propane recycle rate.

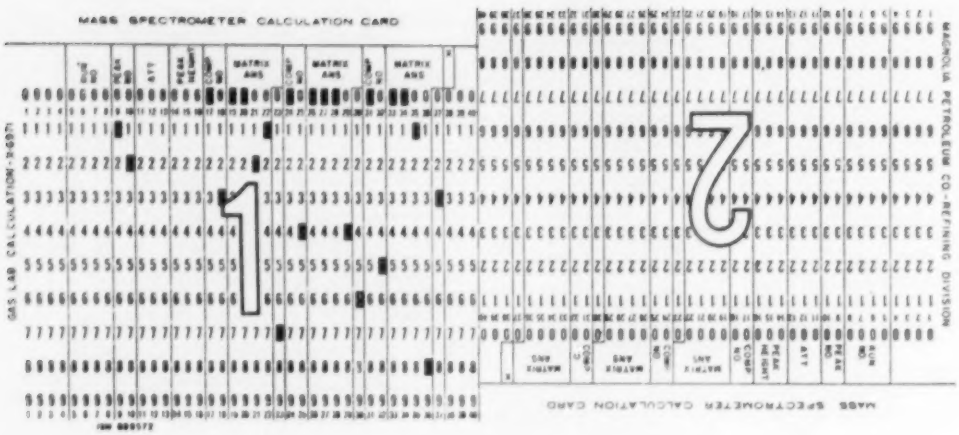
Evaluation of the data also indicated that the effect of degree of hydrocracking upon the gas plant was negligible. While it is true that product distribution varies widely with the degree of hydrocracking, no changes in gas plant operating conditions would be necessary to maintain a high light-ends recovery.

All these data have been helpful particularly in operating the gas plant at an optimum level. They are of value also in other product planning work our division does. They also will prove of value in the determining design specifications for future gas plant revamping, or in the design of future new gas plants.

This data will be kept on file as a library of ready reference material—in tabular form as printed by the I.B.M. equipment, and in the graphical form which resulted from the correlation of these calculated results. These data will save us countless hours of future calculations.

The machine program for this problem is in essence a simulation of the gas plant operation, and this aspect has already proved valuable in some of our work. For example, Fig. 4 shows one of the schemes our engineers proposed for revamping the current gas plant to provide feed for an extraction unit.

As shown in this flow diagram, a depentanizer flash drum, flash tower, and reflux drum were programed into the original problem. This programing took a matter of a few hours, and the required calculations to prove whether or not this was a feasible scheme were performed in a matter of minutes.



CARD containing constants. Fig. 1.

An hour's work in 10 minutes as . . .

Digital Computers Speed Gas Analysis

Here is a step-by-step computer procedure

by Howard A. Young

THE time required for calculating the results of a mass spectrometer gas analysis can be shortened from an hour or more to 10 minutes or less by substituting a digital computer for the desk calculator.

The digital computer is used by many accounting departments, and may be available for the solution of technical problems without additional expense. However, if the machines must be bought or rented, the payout is usually short even if they are restricted to calculation of the results of mass-spectrometer analyses.

Comparisons here are not restricted to any specific make of computer and are of general nature. However,' for illustrative purposes, the performance of the 602-A Model computer manufactured by International Business Machines is compared to that of a conventional mechanical desk calculator equipped with an electric motor. The volume of work to be done, the cost of the machine, and other economic factors must be taken into consideration in making the proper choice of the equipment.

The speed with which the results are obtained and transmitted to the operators for adjusting the operation of commercial units and thus maintain the plant output at a high level is the most important consideration in arriving at the decision although such benefits are difficult and often impossible to translate into dollars and cents.

Author is with the technical department, refining division, Beaumont refinery, Magnolia Petroleum Co.

REFINING

Computing Steps

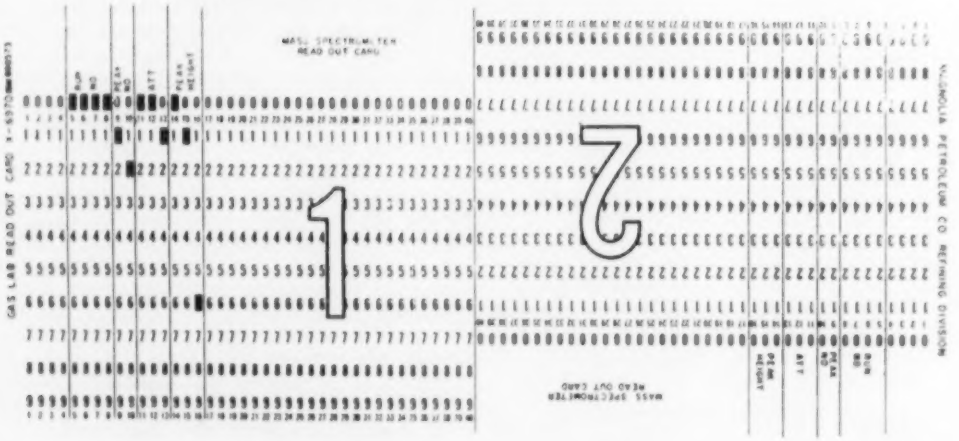
The computer is a card-stored-program unit, and its use in gas analysis involves the following steps:

1. Placing the equations (constants) into calculation decks.

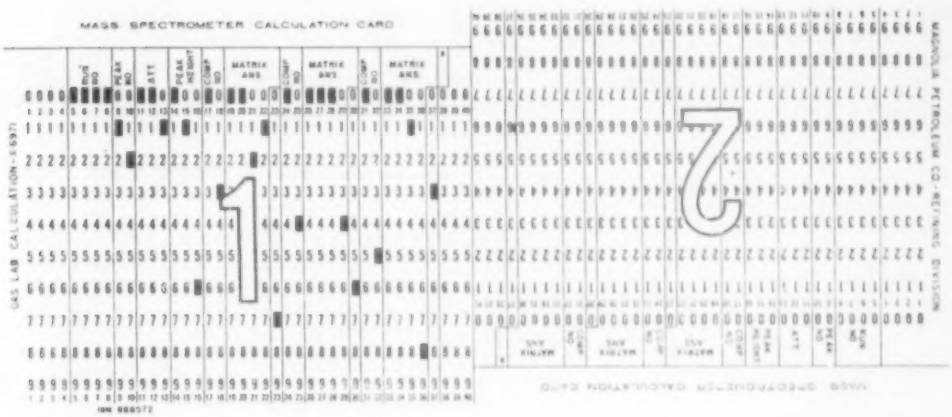
2. Placing the results of mass-spectrometer analysis into the calculation decks.

3. Solution of equations.

4. Obtaining answers from the calculation cards.



CARD containing variables. Fig. 2.



CARD containing variables superimposed on constants. Fig. 3.

5. Listing the results of the analysis recorded on the calculation cards.

6. Reducing the results of calculations to 100 per cent total.

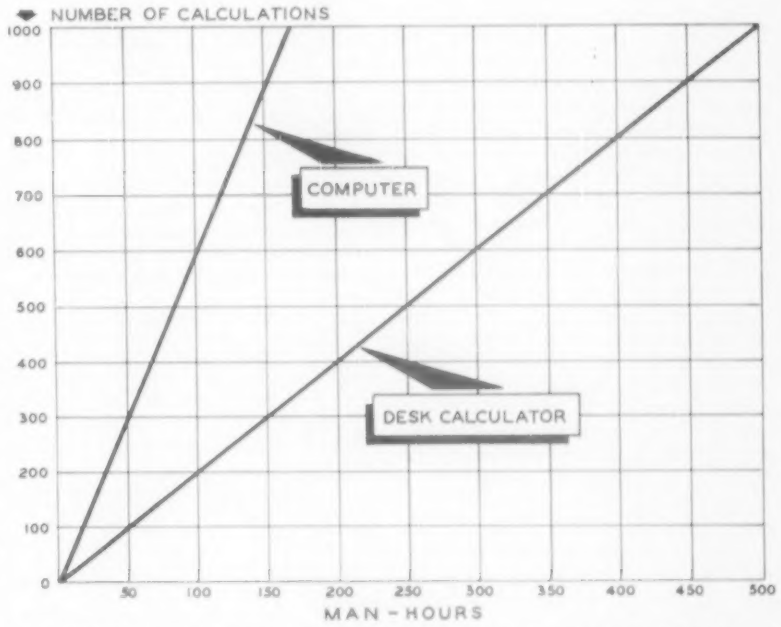
Each step is done separately and consists of the following operations:

1. **Placing the equations into calculation decks** is accomplished on a reproducing machine. The fixed variables, that is constants, in the equations are determined from the results obtained by running pure hydrocarbons on the mass spectrometer. The constants are obtained by arranging the results of these preliminary runs in a matrix and solving it by using the methods developed by Crout[1] or others. Equations containing these constants are recorded on special cards using a key punch. The cards are then assembled in the calculation deck.

Fig. 1 illustrates one of these keypunched cards. When completed, this deck of cards is multiplied on the I.B.M. reproducing punch or a similar machine and stored for future use as the basis for calculating the results obtained by running the unknown sample on the mass spectrometer.

2. **The results obtained in analyzing the unknown gas mixtures** must be converted into digits before they are inserted into the computer. These results, which refer to molecular fragments, are digitized by an analog-to-digital converter called the Spectro-SADIC. This is an instrument used to convert into a usable digital form the selected electrical impulses produced by the molecular fragments and recorded by the mass spectrometer. The SADIC is designed to energize a hole-punching mechanism in an I.B.M. summary punch.

A card punched by the SADIC is illustrated in Fig. 2. These numbers are superimposed on the numbers of the constants on the cards in the deck obtained in step 1 by using the reproducing punch as described previously. A completely punched card is illustrated in Fig. 3.



MAN HOURS required for calculating the results using a desk calculator and a high-speed computer. Fig. 4.

3. **After the calculation deck is punched and reassembled,** it is placed in the computing machine which calculates the results by vector multiplication; that is, by the multiplication of the constants by the data obtained on analyzing the unknown samples. The results of these calculations on the cards are obtained simultaneously as shown in Fig. 3.

If 24 variables are used, 24 calculation cards are acted on by the computer and the results are stored by the machine until all calculations are made. The completion of calculation is announced by the appearance of an "answer" card that is a blank card except for an "X" punch. In this case an X punch in column 38 is used to make the computer total automatically the calculations and punch the answers on this same card. This procedure is repeated until all cards have been through the computer.

4. **Separation of the calculation cards** from the answer cards (each answer card records three numbers, each corresponding to the quantity of a hydrocarbon present in the mixture) is accomplished by means of a card sorter. By sorting out all cards containing an X punch in column 38, the answer cards are readily available for further interpretations.

5. **Interpretation and listing of results** is accomplished on a printer.

6. **The final step** involves elimination of chemical compounds known not to be present and shown by the machine as being present in quantities of 0.1 per cent or less. This is justified because of the mechanical error involved in the solution of the simultaneous equations. The results first re-

ported by the machine are then recalculated to 100 per cent total on the basis of the compounds actually present in the mixture. These results are then transmitted in a suitable form to the unit operators.

Time saving . . . Computers differ from desk calculators mainly in the speed at which the calculations are made. The increase in speed is obtained in two ways. The computers work very fast and the readings pertaining to the intermediate calculation steps are fed to the computer automatically. This automatic transfer of the intermediate data to the computer is much faster and eliminates the human error which may occur in transferring such information to the keyboard of a desk calculator by the operator.

An additional advantage of the new computers is that mechanically they are easier to operate than desk calculators. Anyone operating a desk calculator can become proficient in the operation of these computers in a few hours. Technical and semitechnical personnel are required to obtain satisfactory results irrespective of whether a desk calculator or a computer is employed. By using the computer the personnel is relieved of a tremendous amount of routine work and is available for other work of technical nature.

Fig. 4 illustrates the time involved in the calculation of results by using a computer (I.B.M. 602-A in this case) and by the desk calculator using the procedure of Daigle and Young.[2]

Payout . . . The computer can be paid out on a rental basis if 150 gas analyses are made per week although this varies with the type of computer used. This figure refers only to the man-hours saved by making the calculations. By using the computer one person can calculate the results of at least 200 analyses in a 40-hour week thereby saving approximately 75 man-hours over the desk calculator.

In addition, the use of high-speed computers for the calculation of unit control samples as soon as the analytical data are available permits quick adjustments of the operation for commercial units which may result in savings of many thousand dollars.

Acknowledgment

The author wishes to thank V. A. Kalichevsky for his valuable assistance in writing this article and Magnolia Petroleum Co. for permission to publish it.

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Refining problems made easy when . . .

Computers Provide Efficient

by Kenneth E. Frye and Karl L. Shull

CONVENTIONAL and special-type computers are being used by the manufacturing department, Standard Oil Co. (Ohio), to enable better planning of gasoline-blending operations, effect savings in manpower, and increase accuracy and speed of making blending calculations. Quality problems can be foreseen and corrective action evaluated and taken.

Additional credits are (1) improved quality control, (2) more uniform products, (3) less quality giveaway, (4) upgrading of materials, and (5) lower power costs through the elimination of reblending.

Sohio is using two types of computers. The first is an electronic data-processing unit of conventional types, using punched cards and magnetic-drum storage. The second is a special-purpose computer called a matrix multiplier.

Conventional Unit

Since early this year the operations staff of Sohio's manufacturing department has been using an I.B.M. Type 650 magnetic-drum-data processing machine to calculate on a weekly basis the quality and quantity of the inventory and production of gasoline-component stocks at its refineries.

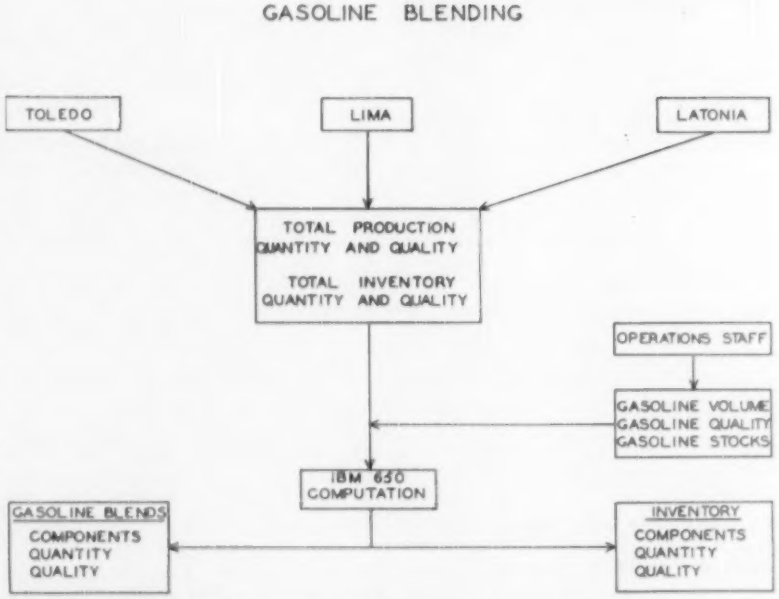
In the past, the calculation of one blending operation for these refineries had taken one technician about 3 hours using a desk calculator and slide rule. By programing the operation on the I.B.M. 650, about 5 minutes are now needed to consolidate and check the plant figures. The I.B.M. 650 runs the problem off in about 35 seconds, with a preliminary 15-minute card punch and a final 3-minute tabulation.

The machine takes all gasoline-stock production and inventory for these three refineries and makes up the blends to meet the sales requirements of our branded gasoline for a 2-week period. Both the quality and quantity are calculated. The refineries develop their production figures from their monthly operation plans based in turn on forecasts of sales.

Fig. 1 shows the flow of the information from the refineries to operations staff and the preparation for the calculation.

Weekly schedule . . . On a weekly sched-

Authors are with manufacturing department, Standard Oil Co. (Ohio), Cleveland. Paper presented at W.P.R.A. regional meeting, Toledo, 1956.



FLOW OF INFORMATION from the refineries to operations staff and preparation for the blending calculations. Fig. 1.

Control System

ule each of the refineries sends to the operations staff quantity and quality data on their total production and their total inventory. The total production lists anticipated production of each gasoline blending stock and the predicted quality.

The total inventory lists the actual amount and the actual quality of each gasoline blending stock that is on hand as of Tuesday morning. The quality points in each case are the distillation volatility, vapor pressure, octane number, and A.P.I. gravity.

The operations staff adds to the refinery information, gasoline volume, quality, and stock limitations.

1. Gasoline volume. This is the budgeted amount of regular and premium grades to be blended during the 2-week period.

2. Gasoline quality. These are the limiting quality points for the calculation and are: vapor pressure, octane, and the limiting distillation volatility.

3. Gasoline stocks. These are the allowable stocks for blending the different grades of gasoline.

This information is programed and sent to the tabulation department for the I.B.M. 650 machine calculation which is carried out in two steps.

Check on requirements . . . Step 1 is the calculation to determine if the proposed production will meet the requirements. To do this:

1. Components for each of the grades of gasoline are vapor pressured to the specification target.

2. The ratios of these components are adjusted to meet the limiting quality points.

3. The percentages of each component in each grade are determined.

4. The percentages are applied to the volume requirements of each gasoline grade and the total predicted quality of each is calculated.

Step 2 is the calculation to determine the status of the actual inventory. It is carried out similarly to the blending calculation in that:

1. All gasoline-stock inventories are combined and vapor pressured to the specification target.

2. The total quantity and quality of the inventory is calculated.

The calculation is returned to operations staff in summary form. It includes in addition to the quantity and quality summaries:

GRADE _____
QUANTITY _____
SEASONAL SPEC. _____

TANK	COMPONENT	LIMITATION	%	DISTILLATION VOLATILITY A	B	C	RVP	O.N.

SAMPLE CALCULATION SHEET for the blending calculations. Fig. 2.

GRADE PREMIUM
QUANTITY 45,000 BBL
SEASONAL SPEC. SUMMER

TANK	COMPONENT	LIMITATION	%	DISTILLATION VOLATILITY A		B		C		RVP		O.N.	
88	U	40-50	42	7.5	3.1	55	23.0	90	37.8	5.0	2.1	60.9	33.9
66	V	10-20	16	22.5	3.6	89	14.2	100	16.0	11.5	1.8	65.2	10.4
40	W	10 MAX.	8	15.5	1.2	56	4.5	95	7.6	12.3	1.0	10.5	8.4
81	X	13-18	15	14.0	2.1	64	9.6	95	14.2	11.0	1.7	72.9	10.9
149	Y	USE MAX.	1	100	1.0	100	1.0	100	1.0	80	0.8	110	1.1
140	Z	15-25	18	16.0	2.9	57	10.2	83	14.9	7.1	1.3	89.0	16.0
			100		13.9		62.5		91.5		8.7		80.7

COMPLETED CALCULATIONS are shown on the sheet in this manner. Fig. 3.

1. Specification ranges for all of the quality points calculated.

2. The quantity and quality summary from the previous week.

With this data it can be determined quickly how well the production and the inventory meet the gasoline quality targets. If it is off in either direction the summary offers a firm starting point for a change. Changes in quality or quantity of certain component stocks can be postulated and the revised data returned to the I.B.M. 650 for another quick calculation. In this manner it is easy to determine the effect of schedule changes, shutdowns, startup of new units, etc.

Plans are in progress for expanding and improving this computation. The present operation combines the three refineries and assumes all the necessary interplant transfers can be made. Further investigation is planned on the practicability of programing the problem on a plant by plant basis, with the volume, stocks, and timing of necessary pipeline movements calculated.

Matrix Multiplier

A special-purpose computer called a matrix multiplier was developed through the combined efforts of the company refinery and the research laboratories. It resulted from the desire to optimize the use of gasoline base stock beyond a pencil and paper calculation stage, but short of linear programing.

This computer has been used extensively at the refinery level and has resulted in better utilization of stocks, a saving in manpower and increased speed and accuracy in calculations.

Many new refining methods such as catalytic cracking, catalytic reforming, isomerization, polymerization, etc., resulted in a several-fold increase in the number of base stocks that could be combined to make finished gasoline. With this increase came the problem of how to economically utilize these materials. It quickly was found that the old rule-of-thumb methods were no longer adequate.

A method was developed based on past experience, experimental blending and testing, trial and error. The heart of the method is the distillation volatility, Reid vapor pressure, octane, and volume use limitations.

A work form for the method is presented in Fig. 2. The pertinent information on each of the component stocks that are to be considered is assembled on the work sheet. For practical blending it was found that distillation volatility and vapor-pressure volatility blended linearly. Such linearity is not possible with octane number unless certain corrections are applied. Such corrections have been applied in the examples used.

Using this form the time required to assemble the data averaged about 15 minutes with an equivalent 15 minutes for each calculation. The calculations were carried out either by slide rule

TYPE OF LINEAR EQUATIONS SOLVED BY MATRIX MULTIPLIER

$$a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + a_5 x_5 = A \text{ [VOLATILITY A]}$$
$$b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 = B \text{ [VOLATILITY B]}$$
$$c_1 x_1 + c_2 x_2 + c_3 x_3 + c_4 x_4 + c_5 x_5 = C \text{ [VOLATILITY C]}$$
$$d_1 x_1 + d_2 x_2 + d_3 x_3 + d_4 x_4 + d_5 x_5 = D \text{ [RVP]}$$
$$e_1 x_1 + e_2 x_2 + e_3 x_3 + e_4 x_4 + e_5 x_5 = E \text{ [OCTANE No.]}$$
$$f_1 x_1 + f_2 x_2 + f_3 x_3 + f_4 x_4 + f_5 x_5 = F \text{ [P]}$$

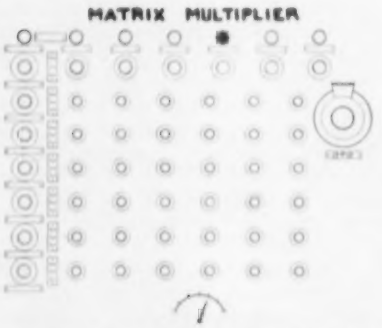
WHERE: x_1, x_2, x_3, x_4, x_5 = VOL. % OF STOCKS 1, 2, 3, 4, 5 RESPECTIVELY
a_1, a_2, a_3, a_4, a_5 = VOLATILITY A OF STOCKS 1, 2, 3, 4, 5 RESPECTIVELY
b_1, b_2, b_3, b_4, b_5 = VOLATILITY B OF STOCKS 1, 2, 3, 4, 5 RESPECTIVELY
c_1, c_2, c_3, c_4, c_5 = VOLATILITY C OF STOCKS 1, 2, 3, 4, 5 RESPECTIVELY
d_1, d_2, d_3, d_4, d_5 = RVP OF STOCKS 1, 2, 3, 4, 5 RESPECTIVELY
e_1, e_2, e_3, e_4, e_5 = OCTANE No. OF STOCKS 1, 2, 3, 4, 5 RESPECTIVELY

Fig. 4.

or calculator. To reach a blend solution required from 6 to 10 trials. It is apparent that the more trial calculations made, the better the chance of obtaining an optimum blend. Fig. 3 presents an example of a completed calculation.

Time reduction . . . An objective in the development of a special-purpose computer was the reduction in time per trial as well as the equivalent accuracy. The matrix multiplier that was developed is a special-purpose analog computer for linear algebraic equations. The type of linear equation that can be solved by the matrix multiplier is shown in Fig. 4.

It consists of a series of electrical circuits capable of storing data on as many as seven different components. The series of data are operated upon by multipliers simultaneously. The products of similar parts of each equation are totaled and read out on the dial of a servo-operated multiturn potentiometer.



LAYOUT of the matrix-multiplier panel. Fig. 5.

Fig. 5 shows the layout of the matrix-multiplier panel. The face of the panel consists of seven horizontal rows of seven dials. On the upper right side of the panel is the read-in, read-out dial used to store the data and read out the answers.

A similarity can be noted between the panel layout and the work-sheet layout. Each horizontal row stores the data for one component. Starting on the left-hand side of the panel the first vertical row of dials are the multipliers. A trial blend is chosen such that the sum of components total 100. The next three vertical rows are the distillation points, A, B, and C, respectively.

The fifth vertical row is vapor pressure and the sixth vertical row, octane number. The last vertical row on the right-hand side can be used for any other critical specification point as may be desired. Between the first and second left-hand vertical rows of dials is a switching arrangement that permits storing the data, reading it out, or eliminating the horizontal row from consideration in the calculation.

Across the top of the panel above the dials is a row of indicating lights that indicate which vertical row is under consideration. At the bottom of the panel is a switching device to change from one vertical row or specification point to another.

The time required to store the distillation volatility points, vapor pressure, and octane data and select a trial blend within the limitations is approximately 10 minutes. The time required to read out a trial-blend result is about 1 minute. Each successive trial can be obtained immediately after the composition adjustment made in the first vertical row.

As many as 6 to 10 trial blends can be obtained in the same time as it previously took for one. The reduction in time and the physical ease of obtaining a larger number of trial blends results in more trial attempts. Thus a more nearly optimum selection for the utilization of the stocks.

Work form . . . An example of a matrix-multiplier work form is shown in Fig. 6. The pertinent data are as-

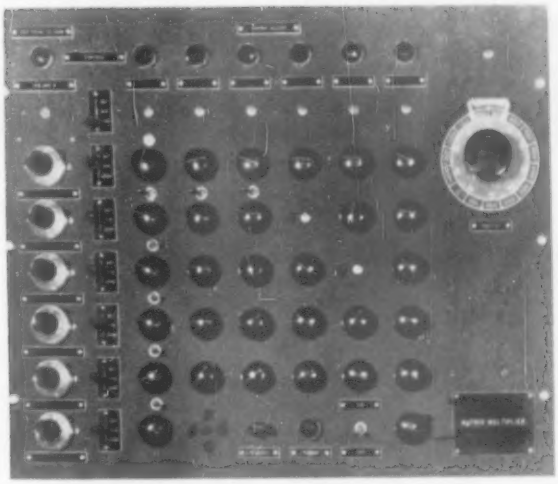
"An objective in the development of a special-purpose computer was the reduction in time per trial as well as the equivalent accuracy. The matrix multiplier that was developed is a special-purpose analog computer for linear algebraic equations."

MATRIX MULTIPLIER CALCULATION SHEET

	TRIAL BLENDS				
15	15	18	15.5	15	
9	8	10	7	6	
40	39	39	38	38	
2	3	2	3	4	
34	35	33	34.5	37	
0	0	0	0	0	
					→ 15.9
					→ 16.2
					→ 16.1
					→ 15.9
					→ 16.0

TANK	STOCK	A	B	C	RVP	O.N.
207	U	35.5	98.0	100	12.0	70.4
202	V	14.0	55.0	94.0	11.8	87.8
213	W	6.5	46.5	92.5	7.9	88.4
252	X	14.0	39.5	88.5	11.8	105
233	Y	19.0	75.0	93.5	9.0	70.2
145	Z	100	100	100	75	110
		63.8	93.9	8.8	80.1	
		64.8	94.0	8.7	79.4	
		64.6	94.1	9.3	79.8	
		64.3	94.0	8.6	79.9	
		64.1	94.0	8.4	79.9	

Fig. 6.



ORIGINAL MODEL of matrix multiplier. Fig. 7.

sembled in the upper right corner. Ordinarily the first trial-blend results are visually inspected and only those blends are recorded that center about the optimum. The component usage limitations can be evaluated quickly with respect to any of the specification points.

On the basis of multiple testing, a tank blend of gasoline will duplicate the matrix-multiplier computation about ±0.5 per cent on the distillation volatility points, and ±0.1 on both the Reid vapor pressure and octane number. The accuracy is dependent mainly upon the assumption that all the base-stock tanks and the blend tanks are thoroughly mixed and that the sampling of each has been representative.

Two models of the matrix multiplier have been built. Fig. 7 shows a picture of the original model. Fig. 8 shows the Model 2 matrix multiplier with vertical panel-rack mounting. The panel wiring is shown in Fig. 9. Both models of this special computor are small enough to be placed on a desk. This permits their use in a laboratory or an office by the people ordinarily doing blending work.

Other uses . . . In addition to gasoline blending the matrix multiplier has been used in the refinery effectively to study the following:

1. Variation of product-quality levels.
2. Variation of component quality.
3. Crude throughput rate.
4. Scheduled unit shutdowns.
5. Emergency unit shutdowns.
6. Pipeline scheduling of products.
7. Tankage usage.
8. Evaluation of components from new facilities.

I.L.S. Instrument Corp., 10701 Briggs Road, Cleveland, has been licensed by Sohio to manufacture and sell this instrument in accordance with Sohio design.

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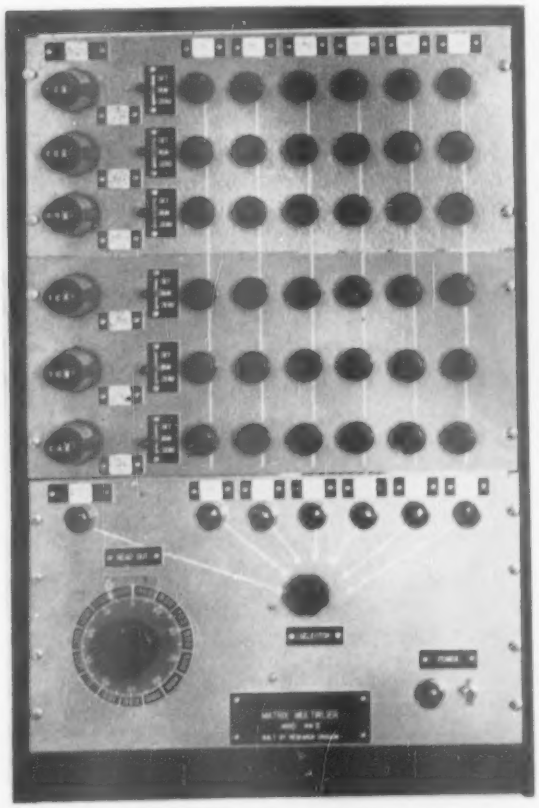
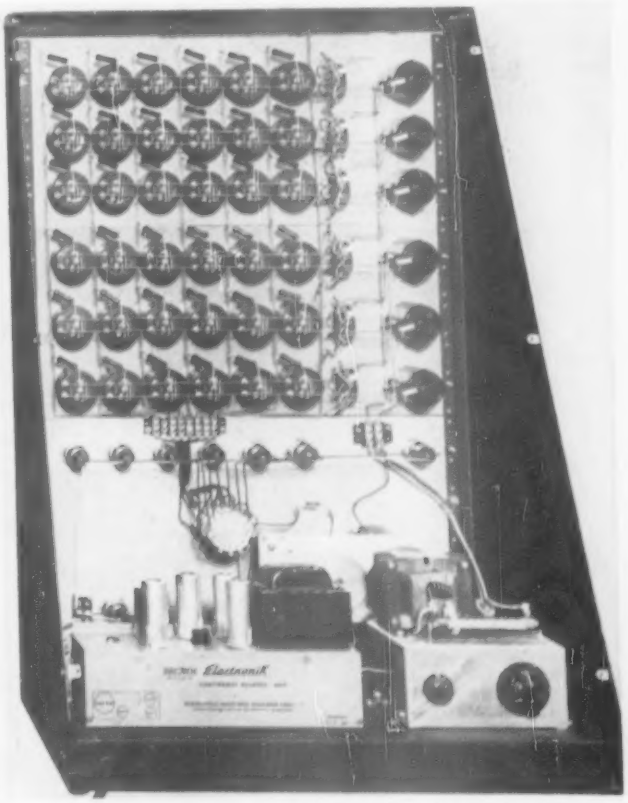


MODEL 2 matrix multiplier with vertical panel-rack mounting. Fig. 8.



PANEL WIRING for Model 2 matrix multiplier. Fig. 9.

New method of analysis helps you discover

Why Gas Wells Have Low Productivity

and improves percentage of successful stimulation treatments

by G. W. Tracy

A NEW method of analysis now can be used to determine the cause of low productivity in gas wells. The basic physical laws for both steady state and transient flow behavior of gas through porous media have been used in its development.

Once the cause of low productivity is known, it may be possible to design a stimulation treatment which will result in an increase in productivity. This method of analysis should improve the percentage of successful well-stimulation treatments since it will aid in the selection of the size of treatment to be considered.

A new scheme may be used to determine the static pressure about a producing gas well. This method is an adaptation of a procedure first suggested for use in determining the static pressure about an oil well.

Reservoir transients . . . In the development of the theory of pressure transients in gas reservoirs, several assumptions have been made by the investigators[2,3,4] reporting on this subject. These assumptions are as follows:

1. Uniform formation permeability.
2. Uniform gas viscosity.
3. Constant mass producing rate during a drawdown test or prior to a buildup test.
4. The compressibility of gas is equal to the reciprocal of the static pressure at any time. This assumption is good, provided the pressure drop between surveys does not exceed 10 per cent of the static pressure.

Author is with Stanolind Oil & Gas Co., Tulsa. Paper presented at ninth oil-recovery conference, T.P.R.C., College Station, Tex., 1956.

Aronofsky and Jenkins[2] have calculated the performance of a gas well producing at a constant rate. They showed that the transient performance was much the same as that experienced in oil reservoirs. To illustrate the similarity between a gas system and an oil system, the following equations were developed from the results of Aronofsky and Jenkins, and Van Everdingen and Hurst:[5]

For an oil system:

$$P_s - P = (q_o \mu_o \beta / 4\pi hk) \times [\ln(Kt/\phi\mu c r_w^2) + 0.80907] \quad (1)$$

For a gas system:

$$P_s^2 - P^2 = (q_g \mu_g TZ / 2\pi hkT_a) \times [\ln(KtP_s/\phi\mu r_w^2) + 0.80907] \quad (2)$$

It can be seen that these equations are similar. The points of difference are as follows:

1. P, in the oil equation, is replaced by P^2, and P_s by P_s^2.
2. In the denominator of the coefficient of the bracket, the 4 is replaced by a 2.
3. $(q_o\beta)$ is replaced by $(q_g Z T/T_a)$.
4. The compressibility factor c is replaced by the reciprocal of the static pressure.

As a consequence of the article by Aronofsky and Jenkins,[2] much of the information which can be obtained from pressure transients measured on oil wells also can be obtained from gas wells.

Permeability determination . . . Using Equation 2 a correlation of well-bore pressure versus the logarithm of time while the radius of drainage is expanding gives a straight line. The slope of this straight line, m, can be used in determining the formation permeability K at a distance remote from the well bore. The formula to be used in calculating the formation or interwell permeability from drawdown or buildup data is as follows:

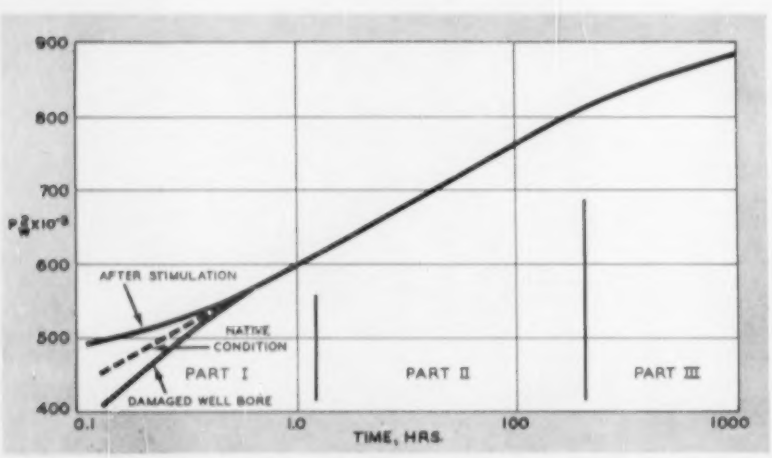
$$K = 1{,}637\, Q\mu_g ZT/Hm \quad (3)$$

As a portion of the analysis to be presented in this article, equations are to be used for steady-state flow of gas in a porous media. The steady-state equation is used to calculate the overall permeability of the formation from a productivity-index test. Aronofsky and Jenkins[2] presented a formula for calculating the steady-state flow rate into a well bore. A modification of their equation is as follows:

$$Q = \frac{0.000704\, HK\,(P_s^2 - P_w^2)}{\mu_g TZ\,[\ln(0.472\, R_e/R_w)]} \quad (4)$$

The pressure buildup performance of a gas well can be divided into three parts. The shape of the early portion, Part I of Fig. 1, varies with two factors, which are as follows:

1. Fillup or afterflow into the casing and tubing during pressure buildup operation.
2. A zone next to the well bore with permeability different from that in the interwell area.



GAS-WELL PRESSURE curve shows the influence of fillup or afterflow into the casing, the permeability of the zone next to the well bore, and the interwell permeability. Fig. 1.

PRODUCING

Calculations were made to determine the duration of time that the pressure buildup data would be affected by fill-up of the well bore. As a result of these calculations, the effect of afterflow cannot be considered negligible until 60 minutes' buildup time has elapsed. Because this flow behavior affects all tests, the early part of the data cannot be used for analysis.

Part 2 of Fig. 1 can be used to determine an average value of the permeability K throughout the interwell area. This is done by employing the slope of the straight line and Equation 3.

Capacity calculation . . . An analysis was made of some of the data presented in an article by M. H. Cullender.[6] The value of capacity KH was calculated for several tests on the same well. Although consistency does not assure correctness, it usually furnishes confidence in the results.

WELL 1

Date of test—	Calculated interwell area KH, md.-ft.
Oct. 24, 1944	3,960
Dec. 11, 1945	4,650
Jan. 11, 1946	4,390
Jan. 15, 1946	4,380
Jan. 17, 1946	4,310

WELL 4

Date of test—	Calculated interwell area KH, md.-ft.
Sept. 28, 1949	970
Sept. 30, 1949	1,168
Oct. 3, 1949	900
Oct. 4, 1949	1,058
Oct. 5, 1949	970
Oct. 6, 1949	850
Oct. 7, 1949	910
Oct. 11, 1949	990
Oct. 14, 1949	952

The above data are presented to show that the capacity can be determined from well-test data with reasonably consistent accuracy.

Part 3 of Fig. 1 is a portion that is seldom measured but its existence should be recognized if it is encountered. It represents the behavior of the well-bore pressure which is being affected by the boundary of the system from which it is producing. Since between any two wells there is an interference point, all wells within a field must be considered bounded. If interference between wells is observed, it means that the static reservoir pressure is being approached during the buildup test.

Permeability Reduction Around Well Bore

It has been shown that the interwell or formation permeability can be determined using the straight-line portion of a pressure buildup curve. Gladfelter et al[1] presented a method for combining the transient performance and the steady-state performance to diagnose productivity problems for an oil well. In this article the Condition Ratio was defined and was used as a criterion for diagnosing productivity troubles. The Condition Ratio CR was defined in the following manner:

$$CR = \frac{\text{K from PI data}}{\text{K from buildup data}} = \frac{K_{PI}}{K_{BU}} \quad (5)$$

Let us define a PI for a gas well in the following manner:

$$PI = Q/(P_s^2 - P_w^2) \quad (6)$$

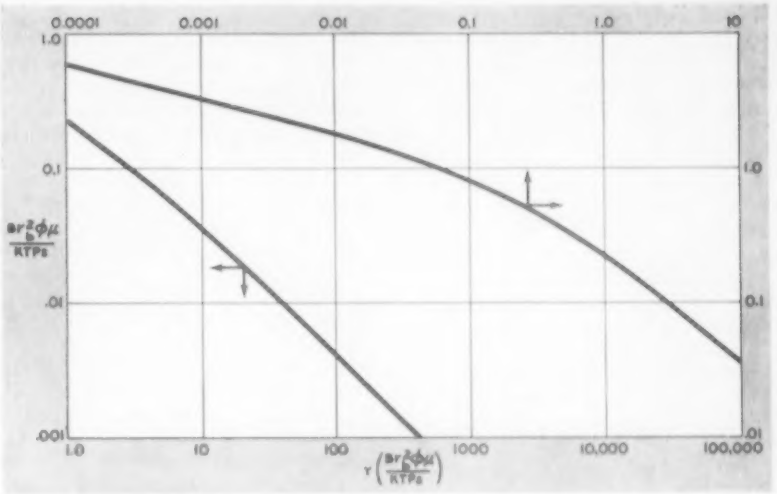
where the nomenclature is the same as was used for Equations 3 and 4. The PI of a well is a steady-state characteristic.

The permeability K_{PI}, as determined from a productivity test, describes the flow conditions throughout the entire drainage area—i.e., the interwell area and also the area next to the well bore. The permeability K_{BU} which can be calculated from pressure buildup data is a measurement of the permeability in the interwell area.

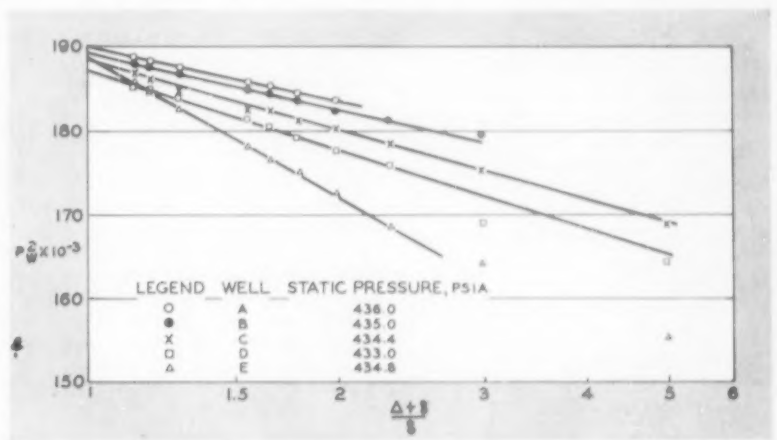
If the ratio of these two quantities (Condition Ratio) is different from 1.0, the permeability next to the well bore is different from that in the interwell area. Therefore, this tool can be used to detect a damaged well-bore condition.

Condition Ratio . . . It may appear from this discussion that the determination of the Condition Ratio would necessitate two separate series of tests on a given well. This conclusion is not necessarily true. The following procedure is suggested as a possible scheme for testing wells and analyzing the data in order to determine the Condition Ratio for a given well.

1. Produce the well continually for



Y FUNCTION correlation is used for calculations to determine static reservoir pressure. (See appendix for procedure). Fig. 2.



PRESSURE BUILDUP on several field gas wells indicates that all have static pressures within 3 psia. of each other. Fig. 3.

several weeks. The longer the producing period, the better the ultimate results. During the last 6 days, the well should be produced at as near a constant rate as possible.

2. Just prior to shut-in, measure the well-bore pressure. This pressure can be used as the stabilized well-bore pressure in calculating the steady-state performance.

3. Shut in the well and measure the bottom-hole pressure as a function of time. The length of time the well is shut in will depend on well conditions. However, the well should be shut in until the log of shut-in time versus P_w^2 is a straight line to be used in Step 7.

4. Determine the static reservoir pressure by either direct measurement or by using the calculation method described in the Appendix.

5. Calculate the K_{PI} by using the producing rate prior to shut-in, the static pressure, the well-bore pressure at the time of shut-in, and Equation 4.

6. Plot on semilog paper the square of the well-bore pressure during the buildup operation against the time after shut-in. The value of P^2 should be placed along the arithmetic scale and time along the logarithmic scale.

7. Using the straight-line portion of the buildup curve, determine the value of the slope, m. The slope is the change in P_w^2 for a cycle change along the time scale.

8. Determine the value of K_{BU} from buildup data by use of Equation 3.

9. Calculate the value of the Condition Ratio, using Equation 5.

10. If the Condition Ratio is less than 1.0, the permeability in the vicinity of the well bore is less than the interwell area. If this is the case, the productivity can be improved by a workover such as acidizing or fracturing.

11. If the Condition Ratio is greater than 1.0, the permeability near the well bore is greater than the interwell permeability. Although such a well does not have a damaged zone around the well, a deep penetrating fracture treatment may substantially increase the deliverability of wells.

The use of the Condition Ratio to detect possible productivity problems appears to offer much promise. Errors in measurements will probably introduce errors in the calculated value of CR by less than 20 per cent. Any well with a Condition Ratio of less than 0.8 is a prospect for a stimulation treatment to overcome well bore damage.

Estimating increase in productivity . . . The probable increase in well productivity to be expected from a particular stimulation treatment can be determined from a comparison of the Condition Ratio before the treatment with that which is normally obtained as a result of the specified treatment. Obviously the use of this method is best when some data has been collected in a given area from a given-type stimulation treatment.

The use of the Condition Ratio in estimating increases in productivity from a stimulation treatment is subject to errors in determining what the Condition Ratio will be after treatment but eliminates to a great degree the important error resulting from not knowing the well's condition prior to treatment. Thus, even with only a minimum of experience in an area, the increases in productivity which will result from a stimulation treatment can be approximated.

The Condition Ratio which will result from small fracturing treatments or small acid treatments is probably limited to a maximum value of 2.0. This means that the immediate vicinity of the well bore has been physically altered to a small degree. If, however, deep penetrating fracturing techniques are used, the Condition Ratio after such a treatment can frequently be as high as 5.0 and often much higher.

To illustrate the method of using Condition Ratio to estimate probable increases in productivity, consider a well which, prior to treatment, had a Condition Ratio of 0.2 and a small fracture was applied to this well. The probable increase in productivity would then be calculated by dividing the expected Condition Ratio after treatment 2.0 by the measured Condition Ratio prior to treatment 0.2. Therefore, the probable increase in productivity would be tenfold as a result of a small fracture treatment.

Low Formation Permeability

The producing rate varies with the formation permeability. Accordingly, if the permeability of the interwell area is low, the producing rate for a unit-pressure drawdown will be low. In the past the existence of low permeability has been determined principally from core analysis and to some degree from steady-state flow tests.

The formation permeability can be determined from analysis of pressure buildup data. If the calculated interwell permeability, using Equation 3, is low (10 md. for 5 ft. of pay or 1 md. for 50 ft. of pay),[8] most of the low productivity is due to low formation permeability. In such cases the productivity can be best improved by using a deep penetrating fracturing method rather than a method which is principally concerned with improving productivity in the immediate vicinity of the well bore.

If the formation permeability is low and also a well-bore-blocking condition exists, the productivity will be extremely low. Even in such cases as this, the best stimulation method should be a deep penetrating fracture rather than a fracturing technique which produces only short fractures.

Static pressure from pressure-buildup data . . . The information which can be obtained from pressure buildup data measured on oil wells also can be determined from gas wells. A method was presented by Horner[7] which outlined in detail the determination of static pressure from buildup data collected from oil reservoirs.

The same theory applies to the determination of static pressure in gas reservoirs. Inasmuch as the theory would be nearly identical as shown in the article cited above, except for the replacement of P^2 for P in the theory, little could be gained by reiterating the theory.

A slight modification of the correlating function shown as Fig. 10 in the previous paper[7] has been reproduced and is included in this paper as Fig. 2.

A detailed procedure and also an example problem is included in the Appendix for the assistance of reservoir engineers.

Fig. 3 presents the pressure buildup curve for several wells in a single field. When the data are extrapolated to the point where $(\Delta+\delta)/\delta = 1.0$, the results indicate that the pressure on all of the wells indicated are within 3 psia. of each other. The latest points of each curve are for 28 days' shut-in time. It is obvious that after 28 days' shut-in time the pressure is still increasing.

Whenever the slope of the pressure buildup curve is steep and the buildup time is comparable to those above, the use of 72-hour measured pressures as static pressures can result in serious errors. An analysis of buildup data should be made to determine the true static pressure.

The method of determining the static pressure assumes that between two successive pressure surveys, the depletion of the reservoir is not greater than 10 per cent. This is necessary in order that the compressibility be approximately the reciprocal of static pressure. This was thought to be a good assumption because in common practice, pressure surveys are sufficiently close to each other that not over 1 to 2 per cent depletion is experienced between surveys.

Low Static Formation Pressure

From an analysis of the pressure buildup data, which will include an evaluation of the static pressure, the existence of a low formation pressure can be detected. In cases where the formation pressure is extremely low,

fracturing techniques may not be attractive, since the amount of gas-in-place is often so low that such a treatment may not pay out.

Conclusions

1. Pressure buildup data from a gas well can reveal the interwell area permeability, the possible existence of a damaged zone around the well bore, and the shut-in reservoir pressure.

2. A knowledge of the above can provide information which can be used in an engineering design of a well stimulation treatment.

(a) If the Condition Ratio (comparison of actual to native productivity) is less than 1.0, a stimulation treatment which affects the vicinity of the well bore can result in a significant increase in productivity.

(b) If the Condition Ratio is greater than 1.0, treatments which affect only the well bore may not be economically successful; however, if the formation permeability is 1 md. for 50 ft. of pay or 10 md. for 5 ft. of pay, or less, substantial increases can be obtained from deep penetrating fractures.

3. A good estimate of the increases in stabilized productivity can be made by comparing the Condition Ratio of other wells in a given area before and after treatments.

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List of Symbols

p = well-bore pressure at any time, atm.
p_s = static pressure at any time, atm.
q_o = oil-producing rate, cc./sec.
q_g = gas-producing rate, cc./sec.
μ_o = oil viscosity, cp.
μ_g = gas viscosity, cp.
h = pay thickness, cm.
k = formation permeability, darcys
β = reservoir volume factor
T = formation temperature, °R
T_s = 60° F. = 520° R.
Z = gas-deviation factor
t = time, sec.
ϕ = porosity
r_w = well-bore radius, cm.
c = compressibility of oil, vol./vol./atm.
Q = producing rate, M.c.f./day at 60° F. and 14.7 psia.
K = formation permeability, md.
H = pay thickness, ft.
m = slope of the plot of P_w^2 vs. logarithm of time
P_s = average reservoir pressure, psia.
P_w = pressure at the well bore, psia.
R_e = extreme radius of drainage, ft.
R_w = well-bore radius, ft.

APPENDIX

Method of Calculating the Condition Ratio

Well data:

Q_g = stabilized producing rate prior to shut-in (meas. at 60° F. and 14.7 psia.) = 2,000 M.c.f./day
P_{wf} = bottom-hole pressure just prior to shut-in = 200 psia.
P_s = static reservoir pressure (calculated) = 987 psia.
T = reservoir temperature = 120° F.
Z = deviation factor (compatible with 987 psia., 120° F., and gas composition) = 0.85
H = pay thickness = 10 ft.
μ = gas viscosity (compatible with 987 psia.) = 0.02 cp. well spacing = 160 acre/well
R_w = well-bore radius = 3 in.

On Fig. 4 the buildup data are plotted. The straight line portion extends from 3 hours through 60 hours.

The calculated value of m = 98,000. Using Equation 3, the value of K from buildup data is as follows:

$$K = 1{,}637\, Q\mu_g TZ/mH$$

$$K = \frac{(1{,}637)\,(2{,}000)\,(0.02)\,(580)\,(0.85)}{(98{,}000)\,(10)}$$

$$K = 32.9 \text{ md.}$$

Using Equation 4 and solving for the value of K from steady state performance:

$$K = \frac{Q\mu_g TZ \ln (0.472\, R_e/R_w)}{0.000704\, H\,(P_s^2 - P_w^2)}$$

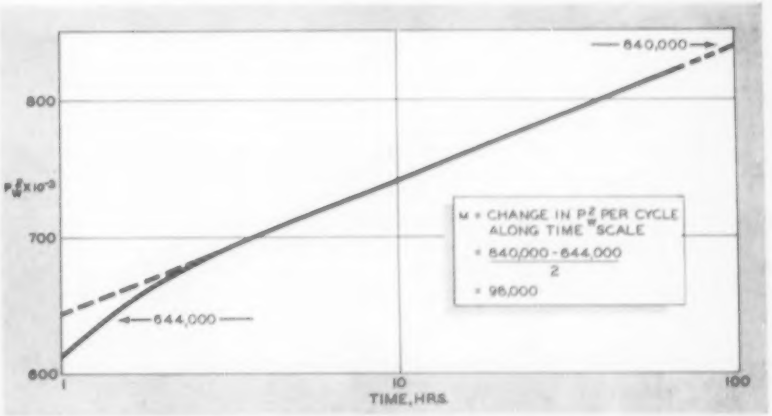
$$K = \frac{2{,}000 \times 0.02 \times 580 \times 0.85 \ln (0.472)\,(1{,}490/0.25)}{0.000704 \times 10 \times (974{,}000 - 160{,}000)}$$

$$K = 23.9 \text{ md.}$$

The Condition Ratio for this example is as follows:

$$CR = \frac{K \text{ from PI}}{K \text{ from BU}} = \frac{23.9}{32.9} = 0.726$$

This ratio would indicate a slightly damaged condition near the well bore.



CONDITION RATIO is determined from the slope of the curve of pressure squared versus the logarithm of time and Equations 3 and 4. Fig. 4.

Stepwise Procedure for Calculating Static Pressure

... **Step 1:** Determine the producing time, Δ, expressed in hours, since the last shut-in period.

1. For prorated wells, Δ will be the hours since the last pressure survey.

2. For wells which are produced at varying rates, Δ can be calculated using the following formula:

$$\Delta = 24\,G/Q_g \qquad (11)$$

where:

G = cumulative gas produced since the last shut-in period, M.c.f. at 60° F. and 14.7 psia.

Q_g = stabilized producing rate just prior to shut-in, M.c.f./day at 60° F. and 14.7 psia.

... **Step 2:** Plot the bottom-hole pressure squared measured at various times, δ, after shut-in in the form

P_w^2 versus $\log_{10}[(\Delta+\delta)/\delta]$, where δ is the time in hours after shut-in that P_w is measured.

... **Step 3:** Extrapolate the straight line portion of the buildup curve to the point where $(\Delta+\delta)/\delta = 1.0$. This point is called $(P_w^2)^*$.

... **Step 4:** Subtract $(P_w^2)^*$ from the square of the static pressure at the time of the last pressure survey. $P_1^2-(P_2^2)^*$.

... **Step 5:** Evaluate the slope of the straight line portion of the buildup curve, m.

... **Step 6:** Calculate the function $Y\,(Br_b^2\phi\mu/KTB)$ of Fig. 2 by dividing the results of Step 4 by the result of Step 5.

... **Step 7:** Using the results of Step 6 and Fig. 5, determine the variable of the Y function.

... **Step 8:** Divide the results of Step 5 by the results of Step 7.

... **Step 9:** Divide the results of Step 8 by 2.303.

... **Step 10:** Subtract the results of Step 9 from the square of the static pressure at the previous survey. P_1^2-(Step 8).

... **Step 11:** Determine the new static pressure by extracting the square root of the results of Step 10.

The above procedure will allow the calculation of the static pressure for any well. In the case of a new well in a new field, the original pressure can be determined by plotting P_w^2 versus $(\Delta+\delta)/\delta$ and extrapolating the straight line portion to the point where $(\Delta+\delta)/\delta = 1.0$ will yield the square of the static pressure. This is the same procedure as described for the determination of original pressure above.

Sample Calculation of the Determination of Static Pressure

Basic data:

P_1 = static pressure at time of previous survey = 1,226 psia.

Q_g = stabilized producing rate prior to shut-in = 5,000 M.c.f./day

T = 140° F.

H = 100 ft.

μ_g = 0.02 cp.

Gas gravity = 0.8

Gas deviation factor (Z) = 0.8

Well depth = 6,000 ft.

Cumulative production since last survey = 900,000 M.c.f.

Radius of drainage = 1,495 ft. (estimated from well spacing).

Well-bore radius = 0.25 ft.

Buildup data:

Time after shut-in, hours	Bottom-hole pressure, psia.
0	893
2	1,165
5.3	1,168
13.6	1,170
21.5	1,171
35.0	1,173

The following table shows the method for correcting the above data:

(1) Time	(2) P	(3) P_w^2	(4) $(\Delta+\delta)/\delta$
0	893	798,200	
0	1,165	1,358,000	2,160
5.3	1,168	1,363,800	820
13.6	1,170	1,369,400	320
21.5	1,171	1,372,200	200
35.0	1,173	1,375,000	125

Sample Calculation of Static Pressure

Step 1: Calculation of Δ by use of Equation 11:

$$\Delta = \frac{24 \times G}{Q_g} = \frac{24 \times 900{,}000}{5{,}000}$$

$$\Delta = 4{,}320 \text{ hours}$$

Step 2: A plot of Column 3 and Column 4 of the above table is shown in Fig. 5.

Step 3: An extrapolation of the data to the point where $(\Delta+\delta)/\delta = 1.0$ indicates $(P)^* = 1{,}403{,}900$.

Step 4: $P_1^2 - (P^2)^* = 1{,}504{,}300 - 1{,}403{,}900 = 100{,}400$.

Step 5: The slope of the straight line portions is shown to be 13,800.

Step 6: $Y\,(Br_b^2\phi\mu_g/KTP_s)$ = Step 4/Step 5 = 100,400/13,800 = 7.28.

Step 7: At $Y\,(Br_b^2\phi\mu_g/KTP_s) = 7.28$.

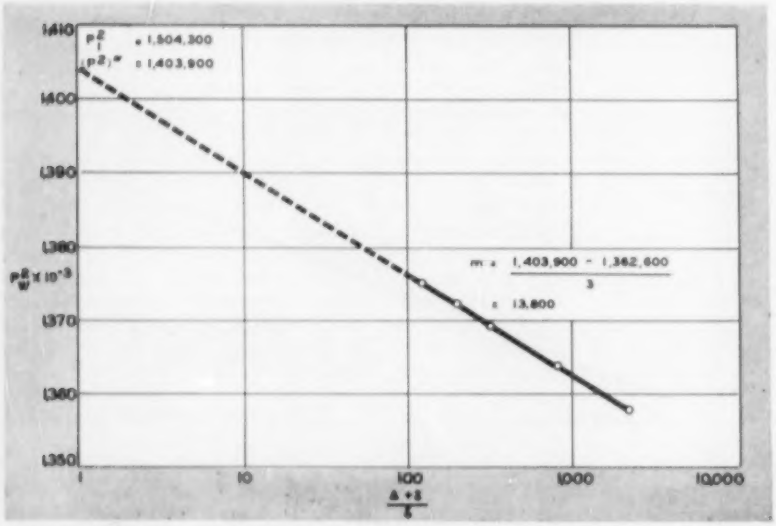
$$Br_b^2\phi\mu_g/KTP_s = 0.049$$

Step 8: m/Step 7 = 13,800/0.049 = 282,000.

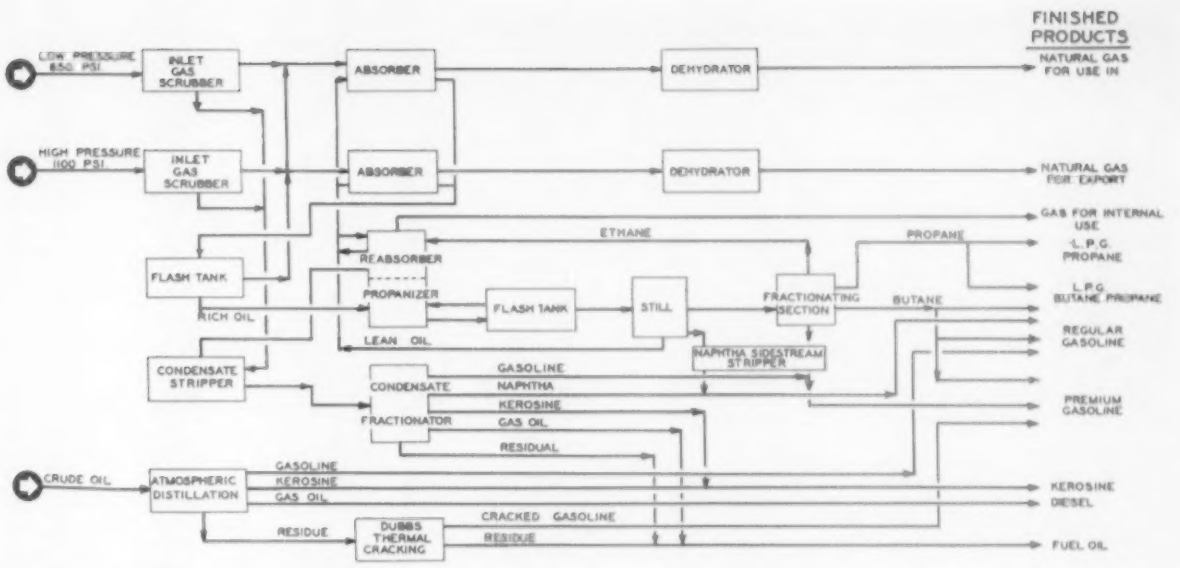
Step 9: 282,000/2.303 = 122,500.

Step 10: 1,381,800 = 1,176 psia.

The static pressure is calculated to be 1,176 psia.



STATIC PRESSURE is determined by extrapolating the pressure curve to $\Delta+\delta/\delta$ equals 1 correcting this value by means of the slope of the curve and the Y function. Fig. 5.



PETROLEOS MEXICANOS new absorption plant at Reynosa has a gas-handling capacity (design) of 300,000,000 M.M.c.f.d. Flow sheet shows how streams from the natural-gasoline plant are tied in with those from the Reynosa refinery to make final products.

New Reynosa Absorption Plant Designed for Huge Capacity

by John C. Reidel
Journal Staff

PETROLEOS MEXICANOS' new Reynosa absorption plant, located just south of the border in the Mexican State of Tamaulipas, has a gas handling capacity (design) of 300 M.M.c.f.d.

- Some 200,000,000 cu. ft. daily of the residue gas from the plant will be exported, under a recently concluded contract, going into the Texas Eastern Transmission system. The remainder of the gas goes to Monterrey and other points to satisfy the demand within Mexico.
- Liquids extracted by absorption, together with condensate fractions, are blended with fractions from the existing 10,000-bbl. per day Reynosa refinery to make regular and premium grades of gasoline, kerosine, and various specifications of fuel oils.
- The new field-processing plant extracts hydrocarbons in four large absorbers. A reabsorber-propanizer, still, and fractionation train (consisting of deethanizer, depropanizer, and debutanizer) complete the hydrocarbon extraction-separation process facilities.
- The still is provided with a naphtha stripper. This operates, as required, on a still sidestream for the removal of an intermediate cut. In effect, this naphtha stripper makes possible production of two hydrocarbon fractions from the still: (1) the usual overhead stream which goes on to the fractionation train, and (2) the sidecut stream which may be blended into regular gasoline ("Mexolina").

The Reynosa natural-gasoline plant was built by Petroleos Mexicanos personnel. Hudson Engineering Corp. designed and engineered the plant and procured the equipment. The large plant was built at a cost of $8,000,000, this including gathering systems, utilities, and other auxiliary installations.

Through the construction of this plant by Petroleos Mexicanos a number of benefits have accrued to the economy of Mexico: (1) importation of 30,000,000 cu. ft. of gas per day at a daily cost of $1,800 is eliminated, (2) production of gasoline is increased by 4,500 bbl. per day, eliminating importation of this same volume at a daily cost of $18,450, (3) sale of 200 M.M.c.f.d. of gas at a minimum of $0.142 per M.c.f. results in a realization of $28,000 per day or $10,000,000 yearly, and (4) importation of L.P.G. is reduced by 2,744 bbl. per day, or a saving of $4,610 daily.

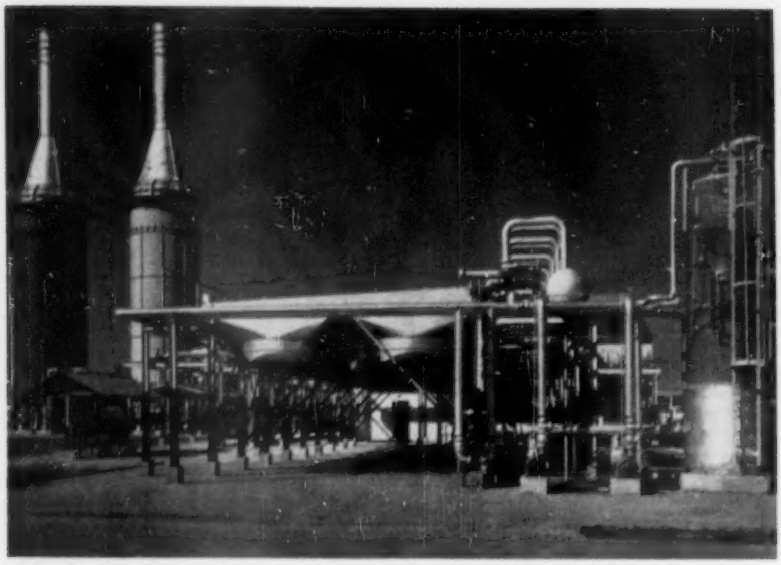
FIELD PROCESSING

Reynosa Processing

As noted the residue gas is distributed in part to fulfill the demands internally in Mexico. The remainder is exported. This necessitates the design of two systems of gas gathering for these two services. One system is for gathering of the high-pressure gas which will go for export, and the other of relatively low-pressure gas for use within Mexico. The high-pressure gas gathering is at a working pressure of 1,100 psi. and that for the low-pressure gas at 650 psi.

For those wells which produce crude oil with gas, separator batteries are employed. The crude oil is received in storage tanks for later pumping to the Reynosa refinery, and the gas stream which is separated is injected into the lines in the gas-gathering system.

The gas streams of the high and low-pressure systems are received in the Reynosa absorption plant in inlet gas scrubbers in which distillates are separated as well as small quantities of crude oil entrained in the gas. The wet gas passes through absorbers in which the major part of the propane, the butanes, the natural gasoline, and the heavier hydrocarbons are extracted. Lean gas goes through dehydrators. The liquids removed in the inlet scrubbers go to a flash tank where lighter hydrocarbons are liberated and passed to the reabsorber section from which the more heavy hydrocarbons go to the condensate fractionator. In this latter vessel these hydrocarbons are separated



HEATER AT REYNOSA plant and air-cooled steam condensers for turbo-generators are shown here.

into gasoline, naphtha, kerosine, gas oil, and residual.

Gas composition . . . Average composition of gas employed in design as as follows:

Component	Volume per cent
CO_2	0.02
N_2	0.16
C_1	93.29
C_2	3.31
C_3	1.07
i-C_4	0.36
n-C_4	0.34
i-C_5	0.18
n-C_5	0.16
C_6	0.32
C_7 plus	0.79
	100.00

Absorption . . . As noted, inlet scrubbers remove hydrocarbon condensate and water which has been entrained. The water goes to a disposal system. The hydrocarbon condensate is reduced in pressure through a flash tank and goes to the condensate stripper where propane and lighter are removed and together with some butanes and heavier flow overhead to a condenser. Condenser liquid supplements still reflux. Uncondensed vapors overhead from the flash tank flow to the reabsorber. The stripped condensate goes to the condensate fractionator.

Gas from inlet scrubbers goes through four large absorbers. The rich oil from the absorbers is reduced in two stages through flash tanks. Flash vapors plus those from the condensate flash tank go to the recompressor which returns them to the absorbers. A portion of the rich oil from the lower-pressure flash flows through heat exchangers countercurrent to the partially cooled stripped lean oil and enters the rich-oil propanizer.

Propanizer-reabsorber . . . This vessel functions like a fractionator. The reabsorber forms the top section and acts as a fractionating section. Instead of reflux it utilizes absorption oil. Vapors from the lower propanizer section, plus uncondensed vapors from the condensate stripper overhead condenser, and uncondensed vapors from the deethanizer enter the reabsorber and flow countercurrent to absorption oil. Propane and heavier are absorbed from these streams. Lighter components overhead from the absorber go to the plant fuel system.

Piping is arranged so that the deethanizer residue gas can be returned to the absorbers if necessary. The propanizer is the stripping section of the column and the oil-to-oil exchangers and hot-rich-oil flash tank act as the reboiler. Flash-tank vapors enter the propanizer and flow countercurrent to the rich oil which strips out the methane and a portion of the ethane. The heavier components in the stripping vapors are absorbed and displace the methane and ethane in the rich oil.

The degree of demethanization and deethanization is controlled by the pressure established for the reabsorber-propanizer-still system by means of the pressure controller in the reabsorber residue gas line.

Distillation section . . . Rich oil from the hot-rich-oil flash tank goes through heat exchange and direct-fired heaters to the still. A portion of the rich oil bypasses the heating equipment and is used as still reflux. The optimum quantity of rich-oil reflux is determined by calculation and the remaining reflux requirements of the column are furnished by condensed overhead vapors in the usual manner.

Facilities are provided for continuous reclaiming of absorption oil and for manufacture of absorption oil from the stabilized condensate. The absorption oil reclaiming facilities are designed for a feed rate which permits rerunning of the entire volume of lean absorption oil in the system in 7 days and to produce several times the required absorption oil makeup.

Naphtha sidestream stripper . . . An intermediate cut might be required if the plant produced gasoline of a lower end point than the i.b.p. of the absorption oil. Therefore, a sidestream stripper column is connected to the still. This may be used to deliver a naphtha material of about 325°-400° F. boiling range.

Fractionation Section

Condensate from the still overhead vapors is received in the raw product accumulator and from there pumped to the deethanizer. To reduce the propane content in the uncondensed overhead vapors from the deethanizer, refrigerated condensers are provided for this column. Thus, residual vapors will be approximately 95 per cent ethane, 5 per cent propane, and traces of methane, meeting requirements of commercial ethane product purchasers.

Propane and heavier hydrocarbons are produced as bottoms from the deethanizer and flow in the usual manner through the depropanizer and debutanizer. Propane is produced overhead from the depropanizer and flows through dryers to storage. Butanes are produced overhead from the debutanizer and flow to storage. Debutanizer bottoms go to gasoline storage.

Condensate fractionator . . . Bottoms from the condensate stripper flow to the condensate fractionator where a controlled end-point gasoline is taken overhead and kerosine and heavier materials are produced as indicated in the box flow diagram, Fig. 1. Gasoline vapor pressure is controlled in the debutanizer by the quantity of butanes left in the bottom product. Gasoline end point is controlled in the still and in the condensate fractionator by proper control of pressure and temperature at the top of these columns.

At present the plant operates with 50 per cent propane recovery. It is anticipated that in the future this may be increased to 75 per cent recovery.

The heart of the plant's cooling system consists of a unit in which a water-cooling tower is combined in one structure with air-cooled units.

PETROLEOS MEXICANOS

Gas Processing Plant

REYNOSA, MEXICO

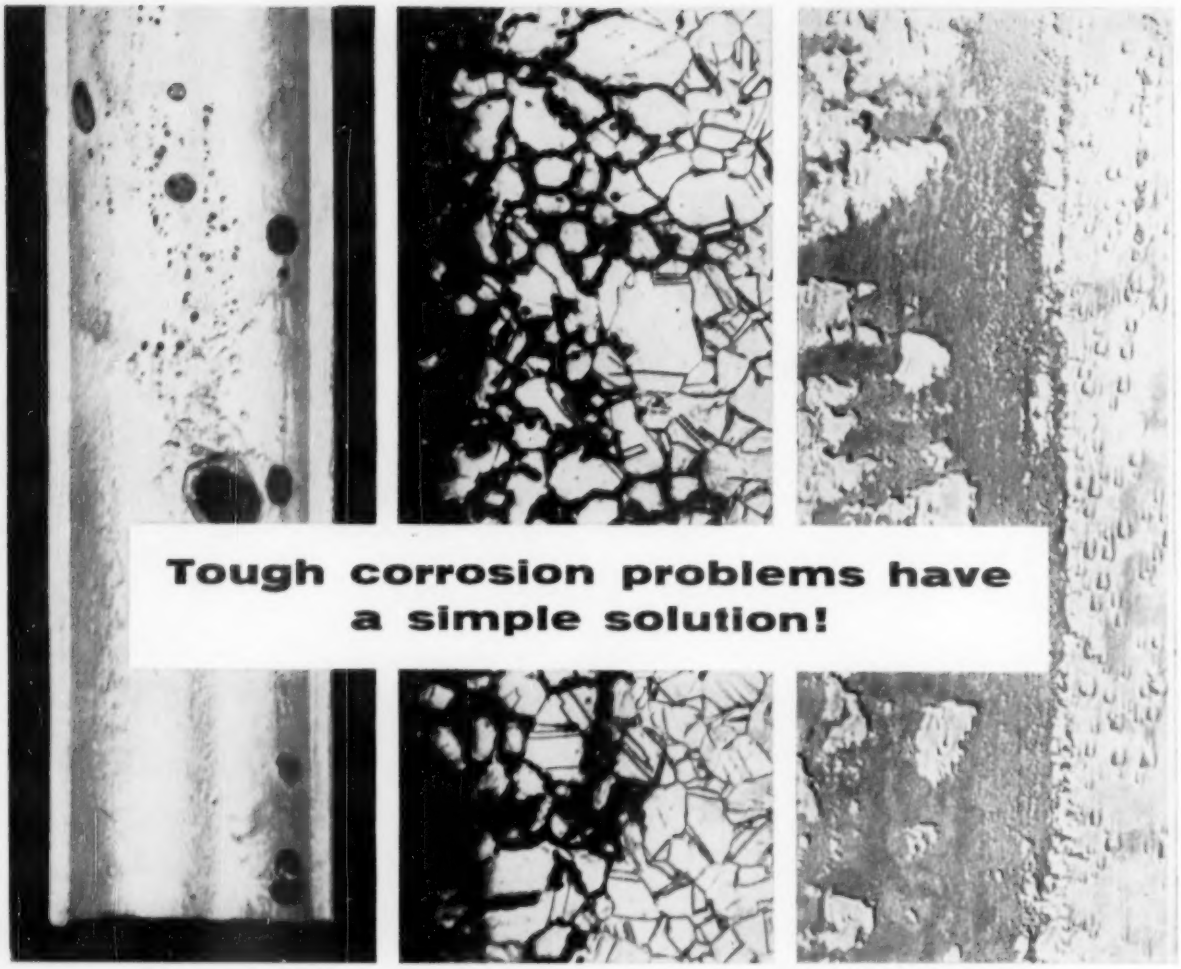
Below the Rio Grande, near Reynosa, in Tamaulipas, Mexico, Petroleos Mexicanos has recently completed this major gas processing project designed to process 300 million cubic feet of natural gas daily gathered from numerous fields within an area of about 400 square miles. About 8,000 barrels per day of fractionated products, including propane, butanes, motor fuel, naphtha and kerosene will be produced.

Engineering design and procurement of equipment was entrusted to Hudson, and the satisfaction of our client is attested by a current contract for a similar but even larger project for Petroleos Mexicanos on the Isthmus of Tehuantepec.

DESIGNERS AND CONSTRUCTORS OF
OIL AND GAS PROCESSING PLANTS

HUDSON
ENGINEERING CORPORATION

FAIRVIEW STATION • HOUSTON, TEXAS



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Mountain Men Try Slim-Hole Drilling

. . . During the past 5 years, 468 slim holes have been drilled in the Rocky Mountain area.

by Phillip L. McLaughlin

MODERN drilling techniques offer hope as one way of reducing the high cost of finding oil. And, slim-hole drilling in particular is getting close scrutiny by Rocky Mountain operators (Fig. 1). This method can materially reduce drilling costs in soft rock areas.

Faced with rising costs and low contract prices, the drilling contractor, too, looks to slim-hole drilling as a profitable method. A slim-hole rig can operate for as little as $582 per day in a given area compared to $885 per day for a big rig. This is a savings to the contractor of $302 per day (Fig. 2).

In the past 5 years, operators have drilled 468 slim holes in the Rocky Mountains (Fig. 1). The vast majority of these holes, 75 per cent, were drilled with 6⅛-in. bits. Approximately three-fourths of the holes were located in the Denver-Julesburg basin.

● In soft-rock areas where drilling time is short, moving costs are important. The slim-hole rig frequently weighs less than half the conventional rig. Moving costs are reduced simply by reducing the tonnage and the loads. This differential could mean the difference between profit and loss. Wheel-mounted rigs are advantageous in some areas while in other areas they are not. Rigup time is generally less because lighter rigs move faster.

● The effect of lighter weight rigs, lower capital investments, and small personnel requirements are reflected in Table 1 and in the daily rig costs shown in Fig. 2. Notice the effect on depreciation, taxes, and insurance.

● Recently developed rock bits in slim-hole sizes appear to be giving almost as much footage as larger sizes. Diamond bits seem to improve performance as hole size is decreased and they are being used more widely.

● Many slim-hole rigs can be operated with four-man crews and some can be operated with three men. Labor is the highest single item in daily rig costs.

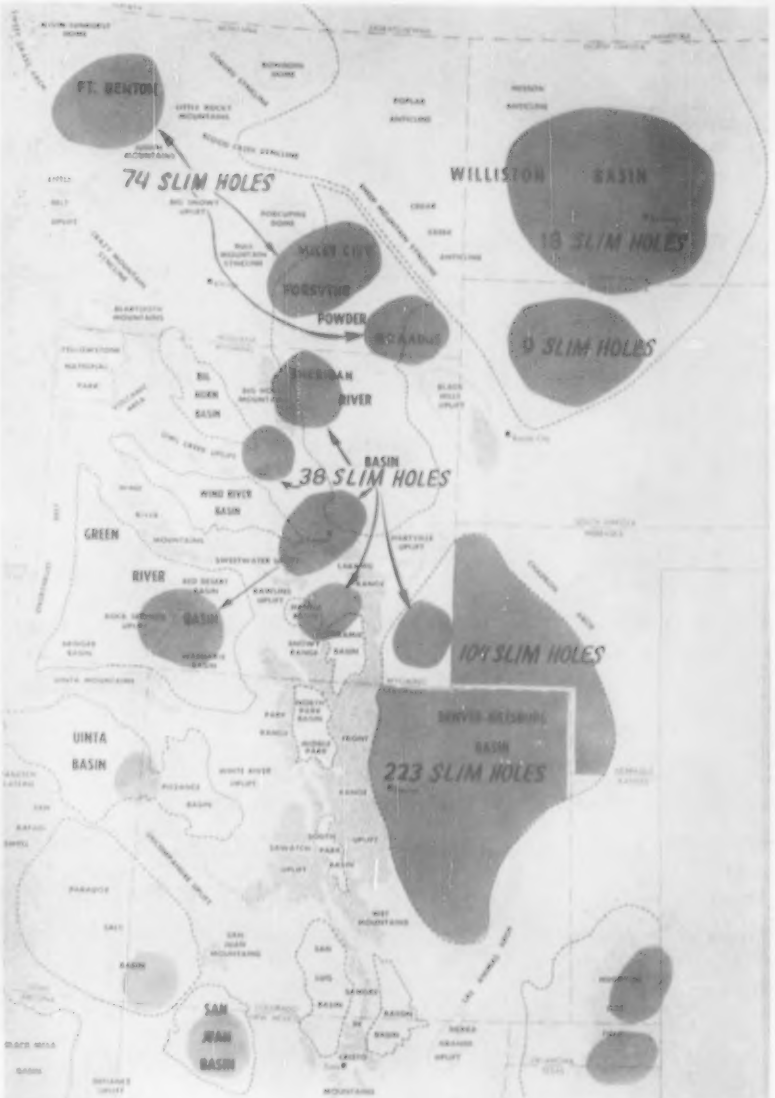
● The slim-hole rig should require fewer repairs. Savings up to one-third might be expected. Fuel consumption varies with the load factor but generally is cheaper for the slim-hole rig.

. . . **Where does** the operator's money go? While drilling contractors with properly balanced slim-hole rigs frequently can realize good profit in competitive situations where big-hole contractors cannot operate profitably, the result generally has been a lower drilling cost for the operator.

The most important savings are in the form of lower day rates and lower footage charges, but the operator can realize important additional savings in logging, casing, perforating, cementing, and completions.

If Rocky Mountain operators accept the smaller hole completions, important additional savings are possible.

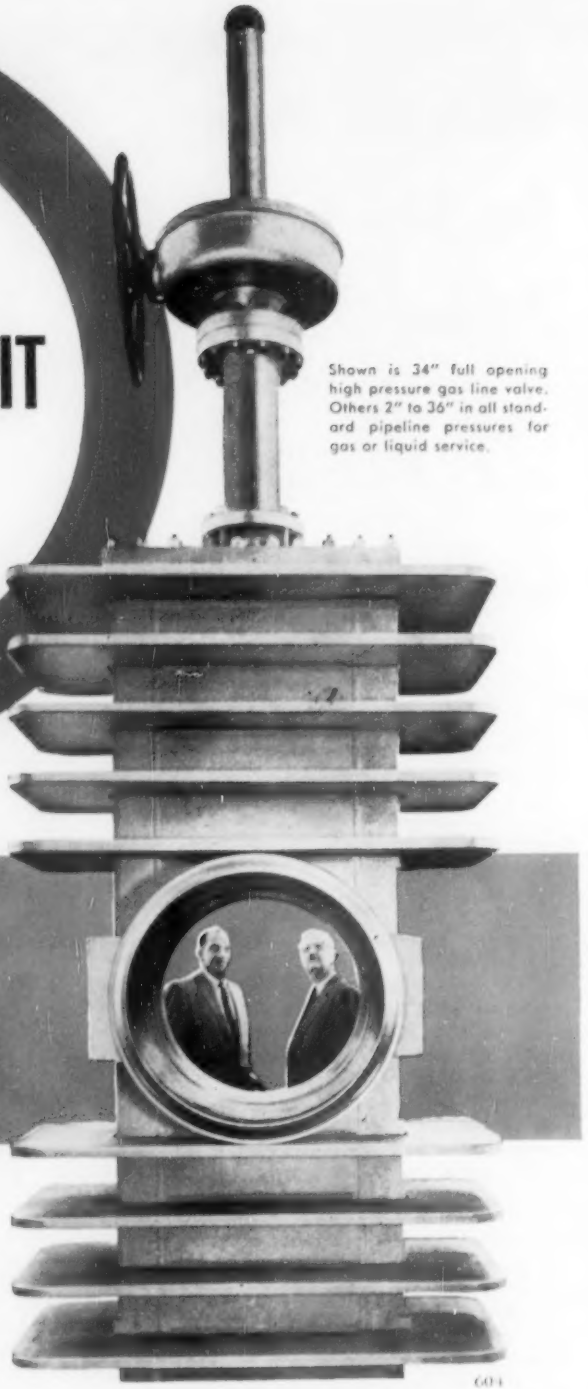
Slim-hole drilling and slim-hole completions are definitely practical. They



OIL COMPANIES are looking to slim-hole drilling as one means of reducing the rising costs of oil finding. Fig. 1.

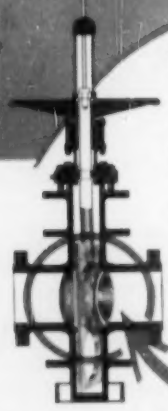
This is an abridged version of a paper by Phillip L. McLaughlin, director, Drilling Research, Cardwell Manufacturing Co., Wichita, entitled "Tomorrow's Drilling in the Rockies." It was presented at the regional spring meeting of the A.I.M.E. in Casper.

the gate valve with THROUGH CONDUIT always in line with the line



Shown is 34" full opening high pressure gas line valve. Others 2" to 36" in all standard pipeline pressures for gas or liquid service.

- Solid one-piece parallel-faced gate always moves freely to the same precise full open or closed position
- No wedging to cause wear and consequent misalignment
- Nothing to impede free movement of line cleaning devices



THE WHOLE VALVE IS RIGHT HERE

When valve is full open or closed, bubble-tight seals on both sides of the gate completely isolate line pressure in the conduit. The body, serving merely as framework for operating mechanism and to prevent loss of product while gate is in motion, may be drained or vented to atmosphere when gate is open or closed. Integrity of seals can be checked any time by a tell-tale valve on the body.

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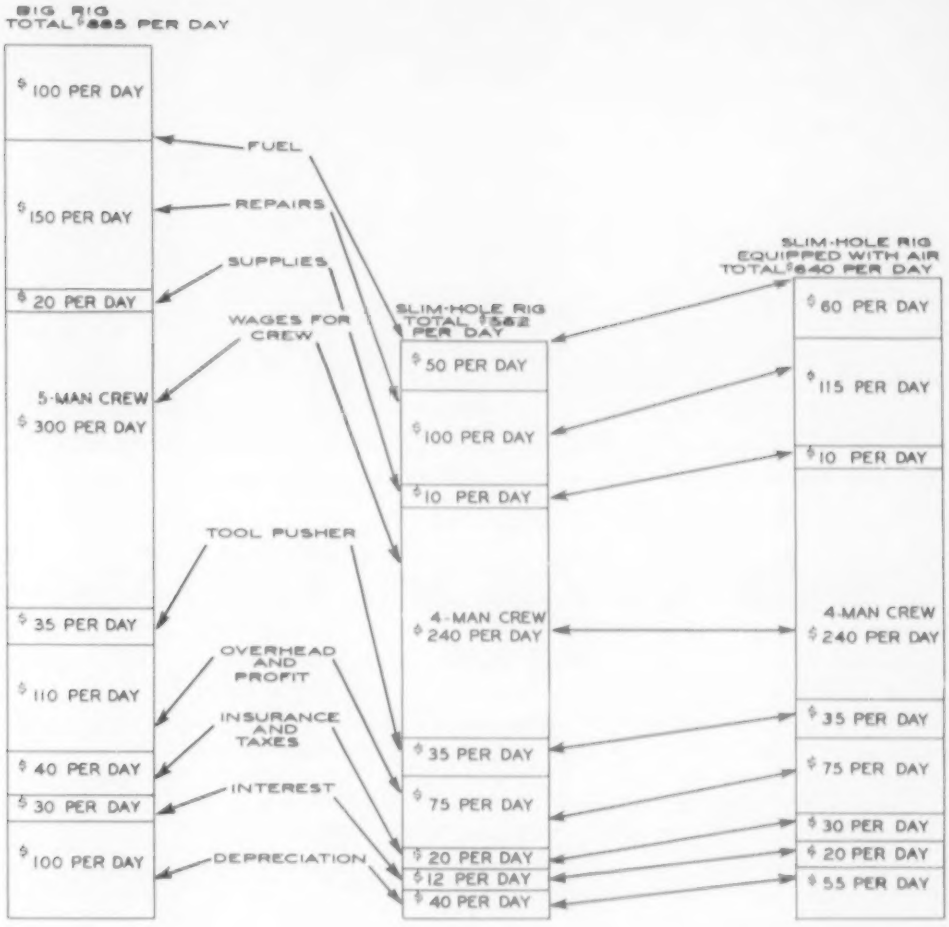


SLIM-HOLE rigs offer substantial savings in daily operation costs to both the drilling contractor and the operator. Fig. 2.

may have some disadvantages as compared to regular completions, but they also have many advantages. Today essential testing can be performed in a 3¾-in. hole and primary logging information may be obtained in 2-in. holes. These holes can be produced satisfactorily since artificial lift and workover equipment is available for wells equipped with 4-in. casing and 1½-in. tubing. All permanent well-completion tools and techniques are developed for 1½-in. completions. Because of these relatively new developments, many leading producers are looking to slim-hole drilling for field development, as well as for exploration.

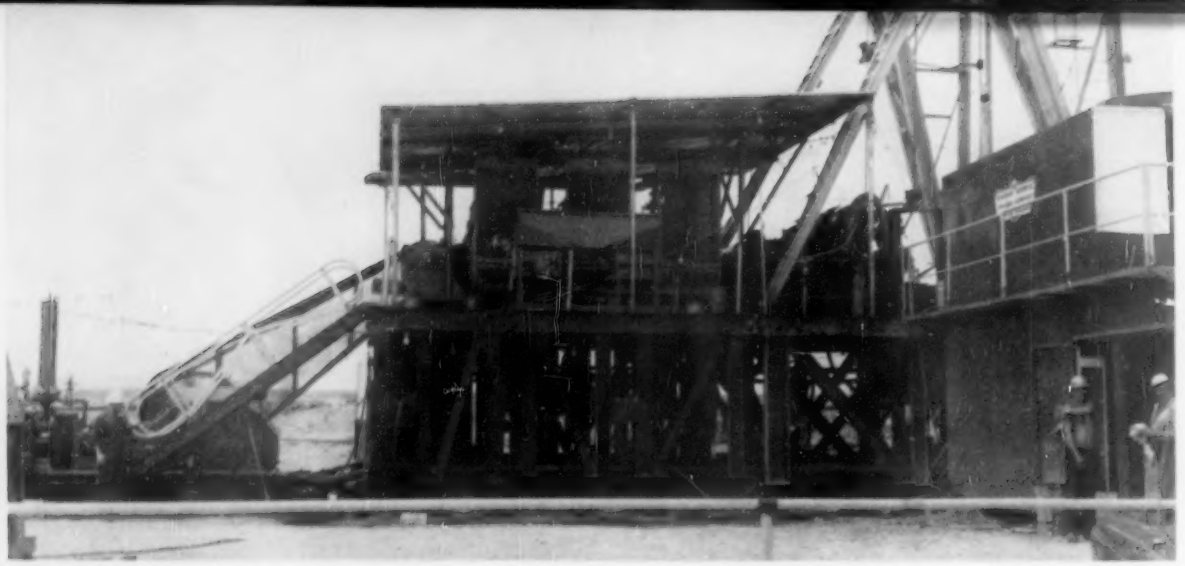
. . . Contractors are caught in a squeeze. Today, in many areas, the drilling contractor is facing undue economic pressure because of rising costs and low contract prices. There is evidence in the Rockies that reductions of daily rig costs are being carried to an unhealthy and unrealistic extreme. The operator has more to gain than anyone, therefore, it is to his advantage to develop a contract "climate" that makes slim-hole drilling economically attractive to the contractor.

Dale Mount, president, American Association of Oilwell Drilling Contractors, recently stated, "We have about reached the peak of efficiency with our present equipment, employing methods currently in common use."

There is a growing belief that if large-hole drilling does not provide the optimum answer, then perhaps slim-holes hold the only alternative.

TABLE I—SLIM-HOLE VS. BIG-HOLE COSTS

	Nebraska		Colorado		San Juan County, Utah	
	Big hole	Slim hole	Big hole	Slim hole	Big hole	Slim hole
Men	5	4	5	4	5	4
Labor, cost per day	$320	$260	$300	$250	$300	$250
Capital investment	$335,000	$150,000	$395,000	$225,000	$395,000	$175,000
Taxes and insurance, per day	$23	$15	$20	$14	$24	$12
Moving cost	$1,800	$775	$9,000	$5,500	$11,000	$3,000
Miles	20	20	350	350	450	450
Weight, lb.	700,000	300,000	800,000	420,000	800,000	250,000
Fuel, cost per day	$60	$45	$61	$48	$67	$40
Repairs	$140	$90	$150	$110	$150	$90
Depreciation w/pipe						
1,000-day—(per day)	$335	$150	$395	$225	$395	$175
1,800-day—(per day)	$185	$83	$220	$125	$220	$97
2,500-day—(per day	$134	$60	$158	$90	$158	$70
Miscellaneous	$50	$35	$75	$50	$75	$35
Water	$1,000	$500	$1,200	$650	$2,000	$700
Field supervision, cost per day	$90	$90	$100	$100	$100	$100
Overhead, cost per day	$100	$100	$90	$90	$90	$90
Bits—surface	2	2	2	2	7	7
Under surface	3	3	4	4	49	60
Bit cost	$800	$600			$10,800	$9,800
Mud	$100	$50	$210	$100		
Day	12	11	12	13	60	70
Depth, ft.	5,400	5,385	5,800	5,800	6,400	6,375
Testing						
Site preparation	$4,000	$1,500				



RIG 1. This 10,000-ft. rig with a 133-ft. mast was the basis for standardization of two other rigs. Engines, mud pumps, and auxiliary equipment are interchangeable.

Standardize Rigs and Save, Says Robinson

Robinson Bros. Drilling Co. operates three rotary rigs in the area of West Texas and southeastern New Mexico. Two of these rigs are identical right down to the pipe racks. The third is simply a smaller model of the other two. This "standardized" equipment pays off in less down time for parts and repairs. It has kept the contractor's investment in spare parts down to a minimum. It has also made it easier and safer for personnel from one rig to work on another.

by Ed McGhee
District Editor

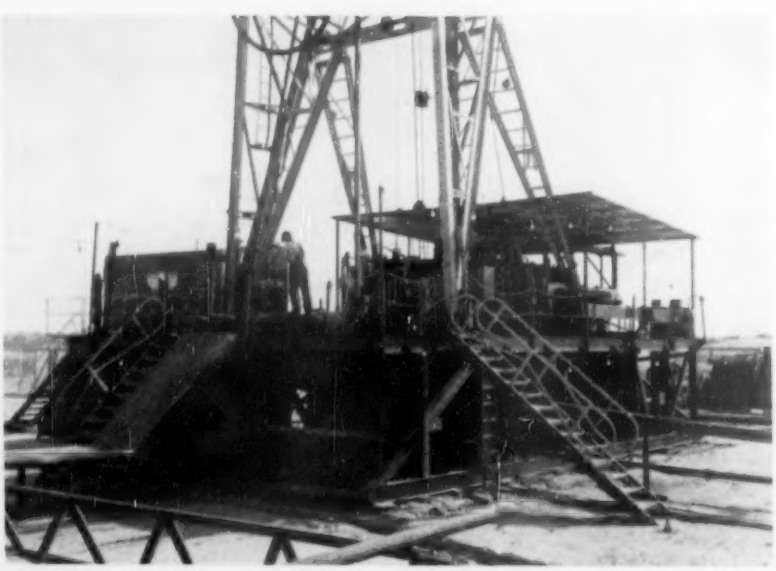
ROBINSON BROS. DRILLING CO., of Borger and Midland, Tex., has three rotary rigs that drill under contract in the West Texas-Southeast New Mexico area. Two of the rigs are rated for drilling to about 10,000 ft., and are practically twins. The other is rated to about 7,500 ft., and uses equipment of the same type as the bigger rigs.

First rig was bought some time ago and first drilled holes to about 10,000 ft. in the Permian basin area. It has a 133-ft. mast and three gas engines. One mud pump runs off the end of the compound and another is skid-mounted in a separate package with its own engine. There are air clutches on the draw works and on the chain compound. It has a 23-in. rotary.

Later Robinson Bros. decided to buy a second rig to be used in the same kind of service as Rig 1. So, there was the question of what kind of rig to buy. Rig 1 had given good service and there appeared to be no reason not to buy another like it. Besides, with two rigs alike, Robinson Bros. reasoned it should be cheaper to operate and maintain them. Therefore, Rig 2 was bought and rigged up almost identically.

Little difference . . . Rig 2 has same draw works and mast as Rig. 1. The main pump and standby pump are just like Rig 1's. Also like Rig 1, the draw-works drive is by three gas engines. However, on Rig 2 there is a different model engine driving the standby pump.

Other equipment—light plant, pipe racks, water tank, flowline, and dog house—is exactly the same on Rig 2 as on Rig 1. Moreover, Robinson rigs up the two on location in exactly the



RIG 2. The only difference between this rig and Rig 1 is a different model engine driving the standby mud pump.

RIG 3. Like Rigs 1 and 2 in most respects, this rig has a smaller draw works and derrick. Only two hoisting engines are used, but these are the same size and type as the ones on the other rigs.

same pattern. Each time one of the rigs is moved, it is laid out essentially the same as it was on the previous location and just as its twin is laid out on its location.

Scaled-down model . . . Operating the twin rigs for a time sold the firm on the "standard-rig" idea. When the time came to buy a third rig, it looked profitable to continue the pattern and give the twin rigs a triplet. However, while Rigs 1 and 2 were doing 10,000-ft. drilling, the third rig would be used for drilling in the 7,500-ft. range. It would be wasted money, of course, to buy a bigger rig for the shallower drilling, so Robinson did the next best thing. As far as possible, the firm bought equipment for Rig 3 identical to that of Rigs 1 and 2; and everything else is a smaller-model size of the corresponding equipment on the bigger rigs.

The draw works on Rig 3 is the same make but lighter than the others. It has a 131-ft. mast. These sizes are the next smaller models of the equipment on Rigs 1 and 2. Only two gas engines are needed to drive Rig 3, but note that these are the same engines as on Rig 1 and Rig 2. And the pump on Rig 3 is identical to the standby pumps on the bigger rigs. The light plant, water tank, dog house, and pipe racks are substantially like those on the bigger rigs.

Fewer parts to stock . . . One of the biggest benefits to Robinson Bros. from having "standardized" on a particular style rig is that less money is tied up in spare parts. Most parts that are stocked could be put in service on any one of the three rigs. For instance, the pump liners will fit any one of the five pumps on the rigs; the same liners fit the two different sizes as well. A spare engine can go in service in any one of nine different places on the three rigs.

Another big advantage is that equipment from one rig may be used on another in an emergency. This means that the rigs have less down time for equipment repairs. Less down time means more profit. Usually, the rigs all operate within easy driving distance of each other. When there is a part failure on one rig, very often, the tool pusher has only to drive to one of the other rigs to get what he needs and doesn't have to wait until new parts can be ordered.

Recently, one of the drilling engines on Rig 3 was disabled during drilling operations. Rig 2 was nearby and its standby pump was not in use. So, the engine from Rig 2's standby pump was dismounted and hauled to Rig 3. Meantime, the disabled engine on Rig 3 had been removed. It took only about 1½ hours to set the new engine into place and have the rig at work again. This interchange saved many hours—and possibly a day or more—of down time on the rig. And Rig 2 did not lose any time because its standby pump engine was missing for a while.

Easier and safer . . . One of the biggest benefits from having identical rigs can't be measured in terms of rig-hours down time or dollars and cents. That benefit comes when a driller or crewman has to be moved from one rig to another. Ordinarily, it takes several weeks for a man to get accustomed enough to a new rig that he can get the most out of it. But, when the new rig is exactly like the old, he can make the change with practically no drop in efficiency. The same applies to the tool pusher. If he knows his rig equipment from previous experience on a twin rig elsewhere, he can keep operations flowing along much more smoothly.

Equally, or more, important is the fact that a man is safer on a rig with which he is completely familiar. He isn't nearly so apt to have an accident if he knows exactly where each major item of equipment is located.

Robinson Bros. drillers claim that men transferred to a new rig from its twin are able to do a better job of housekeeping. Often a floorman moved to a rig with which he is not familiar has all he can do to keep up with the job; as a result, he is likely to leave tools lying about and let the equipment go uncleaned or unlubricated. This doesn't happen on the Robinson Bros. rigs—a man transferred to a new rig knows the tool rack is in exactly the same place that it was on the rig from which he came.

Acknowledgment

Credit is due these Robinson Bros. Drilling Co. personnel for help in the preparation of this article: Joe Shirley, drilling superintendent and Rig 3 tool pusher; Tack Fuson, Rig 2 tool pusher; Berry Ellige, tool pusher, Rig 1.

Major equipment items on Robinson Bros.' rigs are as follows:

Mast: 133-ft. Lee C. Moore (Rigs 1 and 2); 131-ft. Lee C. Moore (Rig 3).

Draw works: Brewster N-75 (Rigs 1 and 2); Brewster N-55 (Rig 3).

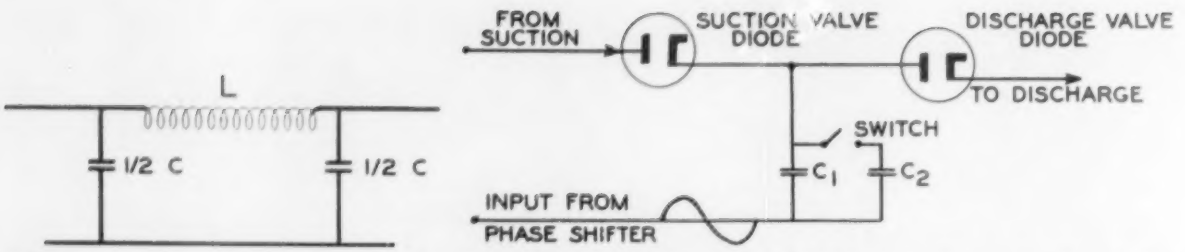
Draw-works drive: Waukesha NKR gas engines.

Standby pump drive: Waukesha NKR (Rig 1); Waukesha LRO (Rig 2).

Main mud pump: Emsco D-500 (Rigs 1 and 2); Emsco D-300 (Rig 3).

Standby pump: Emsco D-300.

Rotary: 23-in. Ideco.



SCHEMATIC of typical pi section; these plug-in units can duplicate any piping situation being studied. Fig. 1.

COMPRESSOR CYLINDER ANALOGY is done with this capacitor "pump". Condenser C_2 represents clearance pocket which can be switched in. Fig. 2.

Not a computer in the usual sense, but . . .

Electrical Analog Helps Solve Design Problems

by Glenn Damewood

In issues of January 9 and 16, 1956, The Oil and Gas Journal presented comprehensive articles about the electric analog as developed by the S.G.A. Pulsation Research Council and Southwest Research Institute. Those articles explained why the analog was the most efficient and complete means of designing against pulsation and gave some results of its use. This article explains the design principle and, workings of the analog.

THROUGH the work of the Southern Gas Association Research Council and the staff of Southwest Research Institute, it was determined that the most practical approach to compressor-station piping design is an electrical analog. The most appropriate analogy was selected, and conversion factors were chosen to insure ease of operation and maximum component availability. Two years of work then were required to finish the detailed design and construction of the first analog facility.

The electro-acoustical analog is not a computer in the sense that it can solve complicated equations. Instead, it is an electrical model of a compressor and its associated suction and discharge piping. Every electrical element in the analog corresponds directly to a mechanical element in the compressor system. Measurements of electrical occurrences on the analog are equivalent to field measurements made at a compressor station.

Basic Theory

The pulsation problem may be presented best by the classical analogy-pressure by electrical potential and mass flow by current. To represent a compressor and its piping, two potentials and two currents must be maintained. The pulsation is represented by a.c. potential and current. Static pressure and flow are represented by d.c. potential and current. The analog is essentially composed of three parts, all of which must operate with the same conversion factors and control variables.

The prime mover . . . Because the timing sequence of compressor cylinders is one of the variables of any pulsation problem, both the geometry and rotational speed of the compressor crankshaft must be represented. This is done with a variable-frequency oscillator and phase shifters. The oscillator generates a sine wave for driving the compressor cylinders at a frequency which is a multiple of the rotational speed of the crankshaft in revolutions per minute. The phase-shift networks are used to represent the angles between crank throws. In this way, it is possible, on the present system, to analog a maximum of six double-acting compressor cylinders driven from a common crankshaft.

The piping . . . Since electric waves travel on a transmission line in a way which is analogous to the travel of acoustic waves in a conduit, it is possible to represent any piping system with suitable transmission lines. It is convenient, to use a system of lumped-constant delay lines for this analogy. The analog uses a number of π sections as its artificial delay line. A typical π section is represented in Fig. 1.

Each π section contains a coil or inductance that represents a given length of fixed-diameter pipe and a pair of condensers which are chosen as a function of the velocity of sound in the fluid contained by the pipe and the diameter of pipe.

In practice, each section of line usually represents a 1-ft. length of pipe and is a plug-in unit. The condensers are separate units which can be combined and attached to the coil sections.

The compressor cylinder . . . One of the most important developments of the research program has been the design and construction of an electrical system which duplicates the pumping action of a cylinder. The analogy is maintained because the charge pumped per cycle of the electrical system corresponds to the mass of fluid pumped per stroke of the piston in the mechanical system. This is shown in Fig. 2.

Each capacitor pump corresponds to one single-acting compressor cylinder. The action of cylinder valves is represented by diodes. The electrical current flows easily from the anode to the cathode of the diode, but cannot flow in the opposite direction. The piston of the pump is represented by a condenser, with one side connected to the

Paper was presented at the eleventh annual short course in gas technology, Texas A. & I. College, Kingsville, May 30, 1956.

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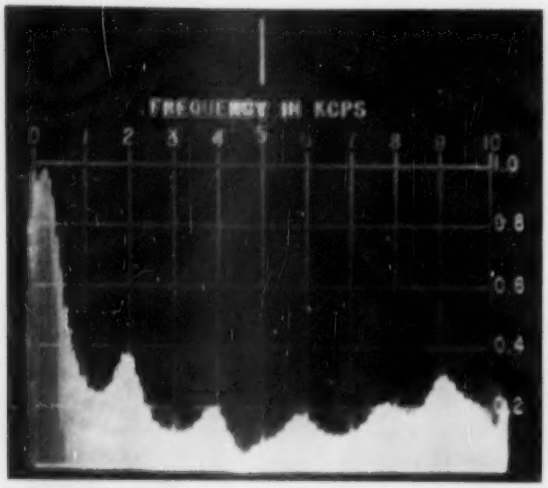
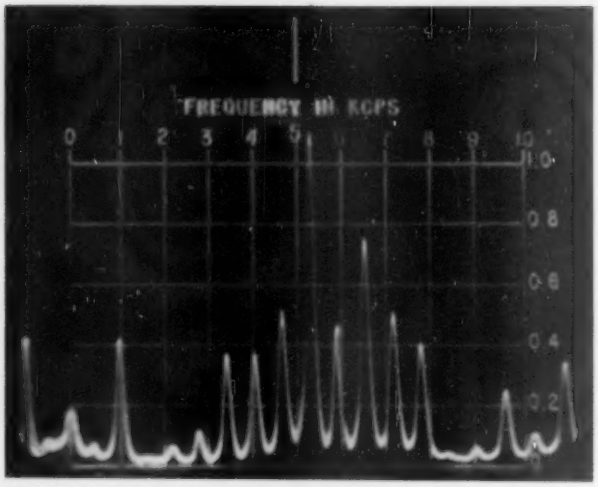


FREQUENCY RESPONSE CURVE for a piping system as seen on the oscilloscope. Fig. 3.



AMPLITUDES AND FREQUENCIES of pulsation as seen during frequency analysis of analoged piping system. Fig. 4.

diodes and the other side connected to one of the outputs of the phase shifter or crankshaft. The condenser sucks electricity in through the suction diode when the driving wave from the phase shifter is going down and forces it out through the discharge diode when the wave is increasing.

The condenser in Fig. 2 is shown as C_1 and C_2 because the value is, among other things, a function of clearance volume. It is possible, therefore, to represent clearance pockets as condensers which may be switched in the circuit to effect a change in loading conditions.

The compressor station analog . . . The choice of analogies to be used for the design of an electrical analog of a compressor station was complicated because a multiplicity of choices was possible and each electrical unit was required to be a part of a system analog. For an electrical element to form part of such a system, a direct correspondence must be maintained between all electrical devices and quanties. The choice of analogies is not independent nor is any one choice completely arbitrary. In the compressor station analog, the following relationships are maintained:

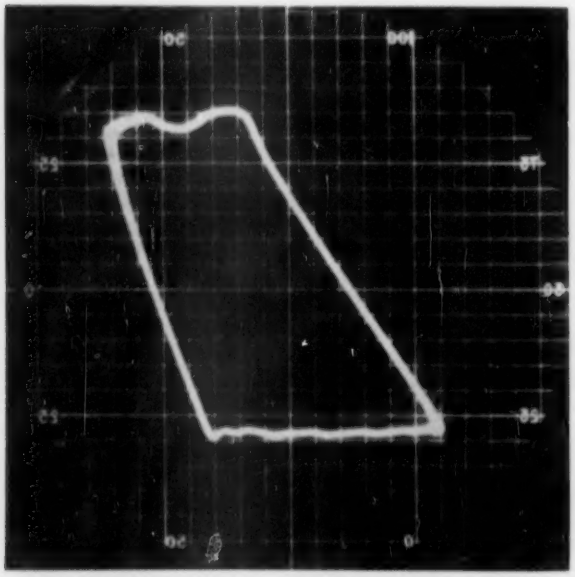
1. Electrical voltage corresponds to gas pressure.

2. Electrical current corresponds to gas flow.

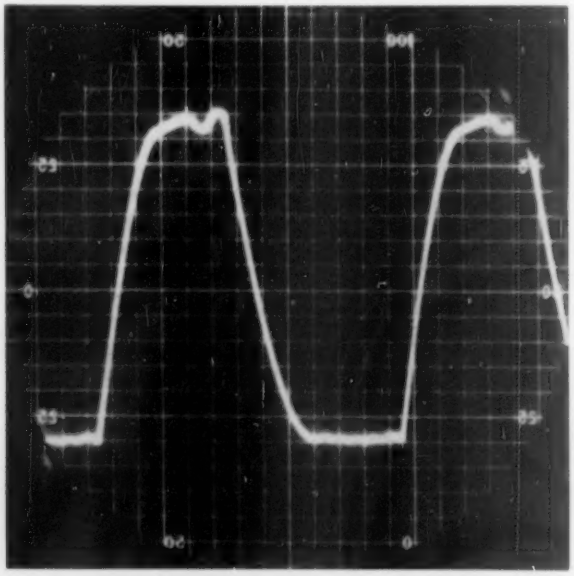
3. Electrical frequency corresponds to acoustical frequency. The frequency of the alternating voltage and current is

THE AUTHOR

Glenn Damewood is a research physicist with Southwest Research Institute and played a major part in developing the electro-acoustical analog described in this article. He was employed as a senior engineer with El Paso Natural Gas Co. from 1953-55. In this work he was responsible for field testing and engineering for pipeline compressors, gasoline plant construction, and acceptance tests on gas turbines. Prior to this he was assistant chief of instrumentation at the White Sands Proving Grounds in New Mexico. Damewood was graduated from the Texas College of Mines, 1949, with a B.S. degree in physics. He has done graduate work at University of Texas.



PRESSURE-VOLUME card from analog. Fig. 5.



PRESSURE-TIME card from analog. Fig. 6.

a known multiple of the frequency of the pulsations.

4. Electrical wave velocity corresponds to the velocity of sound in the gas.

5. Electrical dimensions correspond to the mechanical dimensions of the acoustic elements in the compressor station: For example, the electrical reactance of an electric-wave filter component corresponds to the acoustic reactance of a unit length of pipe of given diameter containing natural gas at a specified temperature.

6. Electrical controls correspond to the compressor controls. For example, a germanium diode corresponds to a valve in the compressor cylinder.

Analog preparation . . . Parameters for the problem are submitted by the company requesting the analog study. A standard data sheet for this purpose contains the following general information:

1. Compressor speed.
2. Operating conditions of pressures and temperatures.
3. Compressor sequence.
4. Physical constants of the gas.
5. Cylinder sizing data such as bore, stroke, rod diameter, fixed and variable clearance, and loading curves.

In addition, a brief statement of the problem is required plus drawings that show all physical limitations to piping design or changes.

From the data, the voltages and capacitor sizes are computed for the compressor analogy and the constants for the π sections of the delay lines are determined. It is then routine to pipe the compressor according to existing or proposed piping drawings and to calibrate the capacitor pump units to operate under the desired conditions of speed, pressure, temperature, and pocket settings.

The analog does not predict the most appropriate piping system to use. It does, however, present a convenient method for analyzing the operational characteristics of any system and provides a quick method of comparing proposed designs.

Types of Problems

Three general classes of problems have been investigated on the analog. These are:

1. **New design:** Problems are usually studied and piping designed for good compressor performance, adequate pulsation filtering, and maximum protection from acoustically excited vibration.

2. **Vibration problems:** Existing plants with either yard piping or compressor vibration have been responsible for most of the problems submitted for design. It usually is desired to design modifications to the existing piping which will reduce the vibration to a satisfactory level and at the same time will require the least piping changes.

3. **Compressor loading problems:** It is required occasionally that the loading characteristics of a unit be changed on a system where vibration is not a serious problem. It is then only necessary to design piping to alleviate the loading condition and at the same time insure that the system will not be impaired with respect to its vibrational characteristics.

Analysis of piping . . . Each of the three general categories of piping design problems requires a separate approach toward solution by analog means. The basic concepts for evaluating the merits of a piping configuration is, however, universal and also may be applied to field measurements. These evaluation techniques are used in combinations depending upon the particular problems which are to be solved

Frequency response . . . One measurement which can be made easily and quickly with the analog is a determination of the frequency response curve for a piping system or portion of that system. A typical transmission curve is shown in Fig. 3.

This data can be obtained by exciting the analoged piping with a sweep frequency generator and by measuring voltage at some point in the piping system. The vertical scale represents amplitude of the output signal and is plotted with respect to frequency. This curve will then be a direct measurement of the effectiveness of the filtering achieved by the piping section. The peaks indicate the transmission regions of the system and are caused by resonant conditions existing in the piping.

The location of the resonance frequencies and the shape of resonant response curves are of prime importance in piping design. Thus, the determination of the frequency response of a system is often the first approach used in the evaluation of the system.

Frequency analysis . . . The final analog test for the pulsation and vibration-control effectiveness of a piping system is made by allowing the compressor analog to excite the delay line representing the piping and to observe the frequency analysis of the complex electrical wave at the proper locations in the piping system. A typical frequency analysis is shown in Fig. 4.

The vertical scale can be calibrated directly in pounds pressure and is plotted with respect to frequency. By choosing the points of observation in the piping system, this technique correctly will define the standing waves created in the piping by the compressor. It also is possible to determine the acoustic forces which can produce vibration and to measure the predicted pressure of any harmonic of engine speed in the piping system.

The determination of cylinder loading characteristics on the analog is made from an analysis of pressure-time and pressure-volume cards taken on the capacitor pump units. Representative cards are shown in Figs. 5 and 6.

Cylinder diagrams are presented directly on a cathode-ray oscilloscope and maintain direct correspondence with the mechanical system for valve opening and closing times, amplitude, and the shape of the wave during the time both suction and discharge valves are open. These cards may be analyzed for volumetric efficiency, indicated horsepower, and capacity in the same manner as a conventional M.I.T. record.

Complex wave . . . This particular record is no longer of any real importance in the analysis of pulsation problems. Nevertheless, such data may be directly observed on an oscilloscope at any point in the analoged piping system.

In addition to the measurements previously described, it is possible to make analog observations of any field measurement of pulsation. Some of these quantities expressed in terms of the equivalent field measurement are:

1. Static pressure.
2. Peak-to-peak or root-mean-square pulsation pressures.
3. Average mass flow.
4. Peak-to-peak or average-mass-flow variations.
5. "Beats" between two units.

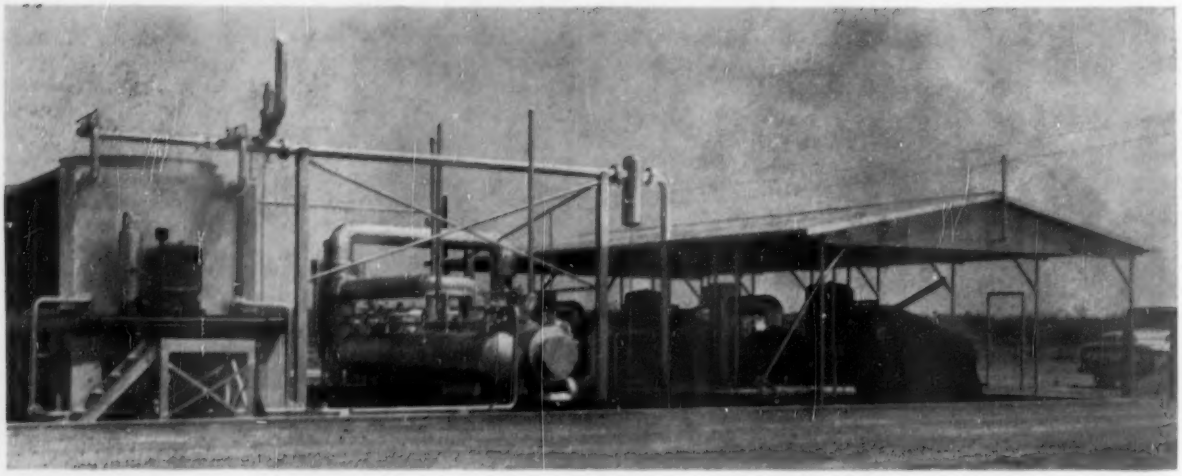
Analog Results

Through the use of the analog, it has been possible to accurately evaluate hundreds of piping systems. From these evaluations new techniques have been developed for the control of pulsation and acoustically excited vibration. The analog has led to the development of new field-measurement techniques and has aided in the interpretation of field data. The principles developed during this project have been applied to successful station designs and have solved problems where earlier attempts had failed.

There have been more than 30 separate design problems worked for member companies.

Acknowledgment

The author wishes to thank members of the S.G.A. Pulsation Research Council, the staff of Sw.R.I. who have worked on this problem, and numerous individuals outside the Pulsation Council who have contributed knowledge, time, and skills leading to development of the analog and who have helped accumulate material used in this article.



REFRIGERATION UNIT increases liquid recovery in low-temperature separation where limited gas expansion is available. The 100-ton vaporizing propane unit will cool 24 M.M.c.f. of gas per day to 30° F.

Lease-operated gas refrigeration gives Delhi-Taylor

6,000 Gal. More Stabilized Condensate per Day

by John L. Chadwick and John H. Crow

LOWER operating temperatures of natural gas-condensate separators result in increased recovery of heavier hydrocarbons from the gas stream. When sufficient pressure is available in the reservoir, this temperature reduction is accomplished by expansion of the gas to a lower pressure through suitable separation equipment. But in order to obtain maximum temperature reduction, low-temperature separation equipment usually incorporates heat exchange between the cold effluent gas and the warm gas from the reservoir.

Injection of ethylene glycol into the inlet gas prevents hydrate formation in the low-temperature separator. The water content of the effluent gas is usually lowered to acceptable limits by the combined effect of low temperature and contact with glycol.

As the gas reserves are depleted, the pressure available for gas expansion is reduced. This results in a higher operating temperature of the separator, reduced liquid recovery, and higher water content in the gas. In such instances the installation of mechanical refrigeration is a means of maintaining the desired separator temperature.

Lease unit . . . Delhi-Taylor Oil Corp. recently installed a complete skid-mounted mechanical gas refrigeration unit to increase liquid hydrocarbon recovery at its Hagist Ranch lease near Freer, Tex.

Authors are with respectively, Delhi-Taylor Oil Corp., and Graff Engineering Corp., both of Dallas.

As is common in the South Texas area, gas is gathered from several wells and is processed in one conventional low-temperature separator with glycol injection. Recovered liquids are processed in a field stabilizer unit. The effluent gas flows to a pipeline.

Due to a reduction in the pressure of the gas-gathering system, insufficient pressure drop was available to effect the necessary cooling prior to injection of the gas into the pipeline. The recovery of liquid hydrocarbons was considerably below that obtained during the initial period of lease operation.

In order to compensate for this loss in available pressure drop, the refrigeration unit was installed to operate in conjunction with the existing low-temperature separator. A 100-ton propane refrigeration unit was selected for this service on the basis of a load of 24 M.M.c.f. per day of gas. Design conditions called for cooling the inlet gas from 65° to 30° F., using evaporating propane at 15° F. The gas is refrigerated at a point just upstream from the pressure-reduction valve in the low-temperature separation unit.

FIELD PROCESSING

It was decided to employ two 11 by 13-in. horizontal skid-mounted compressors, each driven by a 100-hp. gas engine, along with one skid-mounted, air-cooled propane condenser and a skid-mounted evaporating propane heat exchanger with propane accumulator, thus making four separate skid units for this service.

Operation . . . The design conditions for this refrigeration unit are as follows:

Gas rate, M.M.s.c.f. per day at 65° F. and 1,200 psig.	24
Outlet gas temperature, °F.	30
Evaporating propane temperature, °F.	15
Condensing propane temperature, °F.	120
Ambient air temperature, °F.	100
Tons refrigeration per day	100
Compressor speed, r.p.m.	260

Briefly, the refrigeration process involved consists of passing the gas stream and glycol mixture from the heat exchanger on the low-temperature separation unit to a shell-and-tube-type exchanger with the gas and glycol on the tube side and the evaporating propane on the shell side. The shell side of the heat exchanger is a double conical type with disengaging space above the tubes.

Liquid propane from the condenser accumulator is fed into the gas chiller by means of a conventional displacement level-controller after first passing through a small silica gel drier. Low-

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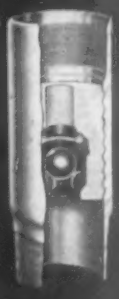

This is the time tested Baker Cement Float Collar (Product No. 101 M&F) usually positioned just above the shoe joint to provide a "stop" for the cementing plug. Used in combination with any type of Baker Cement Float Shoe, Guide Shoe, or the "Whirler" Shoe, to meet the customer's need.

This is the Baker DIFFERENTIAL Fill-Up Shoe (Product No. 1081) which permits the casing to fill automatically from the bottom while it is being run. A variable valve opens to relieve destructive high pressure surges, and closes to regulate casing fill. Ask for Catalog Supplement No. 301, describing DIFFERENTIAL Fill-Up Equipment.

This is the new Baker FLEXIFLOW Fill-Up Shoe (Product No. 160). Permits casing to fill from the bottom through a hole in a flexible diaphragm that opens up to relieve dangerous high pressure surges, and closes down to control casing fill. Cuts casing running time by as much as one-third. Ask for Catalog Supplement No. 325.

This is the Baker Cement GUIDE Shoe usually run in combination with Baker FILL-UP Collars or Float Collars when one back pressure valve is considered sufficient. Safely guides casing to bottom. Specify Product No. 102.

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pressure propane vapor from the gas chiller passes through a vane-type mist eliminator and then to the compressor inlet scrubbers which contain wire-mesh mist-eliminator elements. The compressors, which are speed controlled, compress the refrigerant vapor to the condensing pressure corresponding to the ambient air temperature. Condensed propane flows by gravity to the liquid-propane accumulator located on the gas-chiller skid.

The propane condenser, which is designed to permit normal road-shipping clearances, is an induced-draft type with vertical finned sections mounted on each side of the unit. Two horizontal fans driven by gas engines are used on this condenser.

Stays oil-free . . . Inasmuch as the refrigerant compressor cylinders are oil lubricated, an oil purge system is employed. Oil contamination is removed from the liquid propane by vaporizing a small slip stream of the propane by heat exchange with the condensed propane in the refrigerant accumulator. This vaporized propane passes through a mesh-type mist eliminator where oil is separated and manually drained from the system. The oil-free propane vapor returns to the suction of the compressors.

It is important that no appreciable amount of noncondensable gases be present in the system. To remove inert gases from the refrigerant stream, a refrigerated inert-gas vent system is employed. It is operated continuously to minimize compressor horsepower requirements.

. . . A safety feature, to prevent damage to the refrigerant system in the event of tube failure in the gas chiller, is a safety head and relief valve installed on the shell side of the gas chiller. A snap-acting pilot-operated valve is also included to shut off the flow of gas in the event of excess pressure in the refrigeration system. Relief devices are installed on all items of equipment that can be isolated from the system.

The entire gas refrigeration system more or less "floats" on the line, and the capacity of the system can be changed by varying the compressor speeds.

Capacity . . . The gas refrigeration capacity of the unit varies with the ambient air temperature. Considerably more refrigeration can be obtained during cold weather, as illustrated by the design data in Table 1.

This characteristic is of considerable value, since in many cases, peak-load conditions occur during cold weather. The refrigeration unit can then handle efficiently these higher loads as well as the hot-weather loads.

Prefabricated piping was employed between the various skid units to eliminate welding in the field, and 2 working days were required to erect the units and make the necessary tie-in connections.

The economics for the installation of this gas refrigeration unit are very favorable. It is anticipated that at design rate, over 6,000 gal. per day of stabilized condensate will be produced, over and above the previous liquid production rate.

Acknowledgment

The authors wish to express appreciation to the management of Delhi-Taylor Oil Corp. for permission to publish this article and to R. A. Graff, of Graff Engineering Corp., for assistance in its preparation.

TABLE 1—CAPACITY OF REFRIGERATION UNIT AT EVAPORATOR TEMPERATURE OF 15° F.

Propane condensing temperature, °F	B.hp. per ton of refrigeration	Tons of refrigeration available at 260 r.p.m. (one compressor)
140	2.65	47.1
130	2.28	50.7
120	1.94	55.0
110	1.66	58.6
100	1.44	61.9
90	1.23	65.5
80	1.05	68.8
70	0.86	72.0
60	0.69	75.4
50	0.54	78.5
40	0.42	81.8

BOOKS

TRAFFIC DEPARTMENT ORGANIZATION by John H. Frederick. Published by Chilton Publications, Chestnut and Fifty-sixth Street, Philadelphia 39, 160 pp. $6.

The author points out that transportation generally is the largest single cost item left in the area of controllable costs today. Taking 27 cents out of every sales dollar, transportation today, is directly related to sales, production, research, purchasing, and other top policy corporate matters, according to the author.

Actual case histories from such blue chip firms as Sears, Roebuck; H. J. Heinz; National Distillers; American Chain & Cable; Kaiser Aluminum & Chemical; Maytag; Remington Rand; and others are used to show how a new concept of traffic management has pared costs and produced savings not only in freight, but also in other areas of business.

THE COLD BENDING OF METALS AND ABRASIVE CUT-MACHINING OF METALS. Prepared by Wallace Supplies Manufacturing Co., 1300 Diversey Parkway, Chicago 14, Ill. 170 pp., $2.50.

This spiral-bound book contains material about two little known processes:

1. The Cold Bending of Metals which is described as to types of bending machines used for cold bending of tube, pipe, and structural shapes; the tools for bending, designing for bending, theory of cold bending, and many other chapters pertaining to cold bending of metals. It is well illustrated.

2. The Abrasive Cut-Machining of Metals deals with why abrasive wheels fail—sometimes, and how to prevent this failure; and what abrasive cut-machining will do for you. It is illustrated also.

This book would be valuable for reference study for users and potential users of bending equipment or abrasive cutting equipment.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

Nelson Refinery Construction Index

Appears in the Engineering Section in the first issue each month.
Compiled by W. L. Nelson, Petroleum Refinery Consultant, Tulsa.
The Index was explained July 7, 1952 (page 105), as well as the Indexes of Individual Items of Equipment that appear on the Cost-imating page in the first issues of the months of January, April, July, and October.

	Index (1946 = 100)					
	1949	1952	1953	1954	1955	April 1956
Pumps, compressors, etc.	135.9	155.6	162.5	166.5	172.2	186.4
Electrical machinery	130.9	152.4	156.4	160.0	162.5	171.4
Internal-combustion engines	124.8	146.5	148.1	150.5	153.2	160.6
Instruments	123.1	146.2	151.8	154.6	162.9	180.3
Heat exchangers	133.0	165.8	174.9	171.7	156.8	188.0
Miscellaneous equipment average	*121.6	153.3	158.8	160.7	161.5	177.4
Materials component	143.6	164.3	172.4	174.6	176.1	188.5
Labor component	137.1	163.1	174.2	183.3	189.6	194.9
Nelson construction index	139.7	163.6	173.5	179.8	184.2	192.3

*Used in computing the Nelson Index until April 1952. This is slightly different than the average of the Miscellaneous Equipment Items shown above.

THE TEST TRUCK is equipped with instruments that help gather test data at refineries and chemical plants.

INSIDE THE TRUCK the instruments are arranged to give rapid, efficient, and accurate service.

Shell steps up control studies as . . .

Test truck speeds data collection to computers

by D. H. Stormont
District Editor

DIGITAL COMPUTER in Shell's Emeryville laboratories where problems too difficult to solve in the field are processed overnight and the answer teletyped back the next morning.

A NEW Shell Development Co. test truck will greatly speed studies of process control systems used at Shell Oil Co. refineries and Shell Chemical Co. plants near San Francisco.

Recorded data collected at any plant are transmitted the same day to the Emeryville laboratories of Shell Development. There the message is picked up and tape recorded. It is then transferred to cards for feeding to a digital computer. Instructions on a master tape inform the computer how to process the data.

The next morning the two or three-man team which made the study receives the solution to the problem, via the reverse of the above route. Influence of normal day-to-day variations in a process will be held to a minimum by this speedy data handling.

In addition to providing such information as the optimum points for controlling unit processes in existing plants, the new test unit will gather data to be used in designing better control systems for new plants.

Equipment mounted in the truck includes a six-channel recorder (which can be expanded to 14 channels) and six amplifiers for strengthening signals from the process unit under study. A two-pen pneumatic recorder and a 16-point electronic recorder monitor pressures and temperatures at various points in the process. The test truck can be recording up to 14 records in a matter of minutes after it reaches the test site.

To bring the impulses to the recording equipment seven reels of cable, each 300 to 500 ft. long, are housed in compartments. By mechanical means they can be automatically rewound independently of one another.

After the power, pressure, temperature, and other cables are connected to pickup devices at the process under study, normal operations are upset. This is done usually by changing a signal to a control valve. Then the instruments inside the truck record the reaction of the system at various points in the process as it responds to the input change.

First test run, in part a shakedown cruise, of the mobile lab was at the Martinez chemical plant. Two distillation columns, the secondary butyl alcohol and isopropyl alcohol units, were the objects of the research team's studies.

Reactor-tube turnaround made quickly with big cranes

PULLING THE TUBES, which stand vertically in pairs, was performed by two cranes equipped with 100-ft. booms.

WHEN Shell Oil Co. recently shut down its toluene plant at Wilmington, Calif., its engineering department was faced with a slightly different problem from the usual turnaround.

Principal task was the replacement of all tubes in the three reactor furnaces. Most of the 150 tubes had been in service since 1943, when the plant went on stream to produce toluene for the war effort.

Instead of being placed horizontally as is usually the case, these tubes stand on end in a circle. To remove them they had to be pulled out overhead. Likewise they had to be pulled in pairs because they were connected by common headers. This was accomplished by the use of two cranes, both equipped with 100-ft. booms.

Replacing the tubes was a much greater job than the removal. Each 36½-ft., 5½-in. o.d. tube (of 4-6 chrome, ½ molybdenum steel) had to be rolled or fitted into the headers.

First step was to reassemble the "hairpins" by rolling the tubes into the double headers. This was carried out on the ground. These then were raised to the top of the reactor furnaces and lowered into single headers on the bottom.

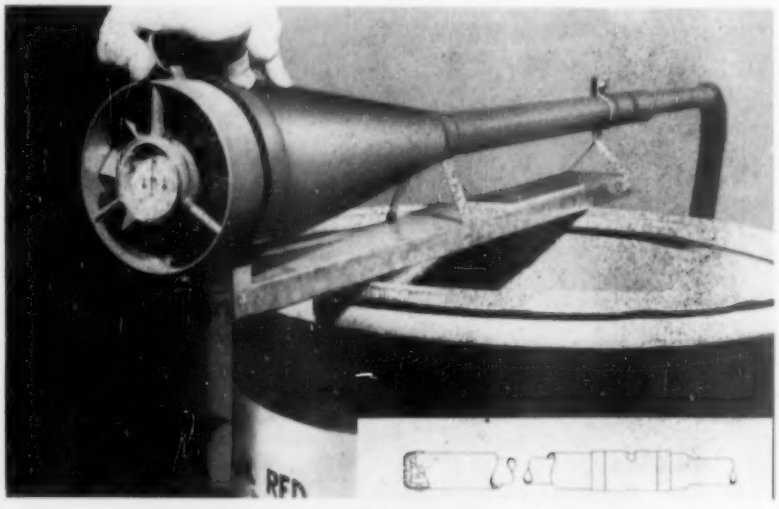
A combination tube roller, operated by 100 psi. air, was used to fit the tubes into the headers. It expanded the tubes into serations in the headers and at the same time flared the tip of the tube to make a tight closure. Working on an around-the-clock basis, the turnaround was completed in 9 days.

New dry-dye probe eliminates clogged lines

TO make the dyeing of gasoline cleaner, faster, and simpler, E. I. du Pont de Nemours & Co., Inc., has developed a new dry-dye eduction probe plus a new method of measuring air flow through the probe.

When the probe and the jig for holding the anemometer measuring device are connected together, the assembly has the appearance of a bazooka. This has led users to dub it the "dyzooka."

The new dry-dye eduction probe, though simple in design, has many advantages over conventional dye probes, which are little more than pipe sections. One is that many field tests under a wide range of conditions have shown it to be clogproof. This probe makes it possible for dye from the shipping drum to be introduced directly into the finished gasoline, eliminating the step of predissolving necessary with some systems.



THE PROBE consists of an aluminum tube within a tube.

The probe consists of an aluminum tube within a tube. The inner tube, similar to the tube for a tank-type vacuum cleaner, sucks the dye from the container into the gasoline stream. The outer tube, the part which makes it different from other eduction probes, supplies a downdraft of air. This downdraft is controlled by two adjustable ports at the head end which insure a continuously fluidized flow of dry dye uninterrupted by clogging.

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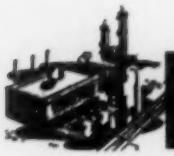


JOB IMPROVEMENT FOR THE PROCESS FOREMAN—60

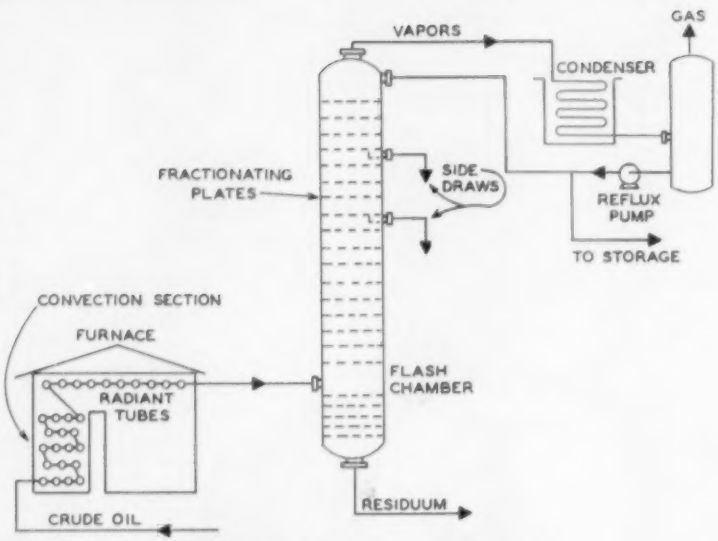
Vaporizer Section Separates Various Fractions

LEAVING the furnace the hot crude is injected into the flashing chamber, or vaporizer section, within the fractionating tower. This section is represented in Fig. 3 by an empty space between two fractionating plates, or bubble trays, near the bottom of the tower. As the pressure in the vaporizer section is considerably lower than that in the pipe coils, most of the crude vaporizes into the free space above. The unevaporated liquid flows downward and passes over a number of stripping trays.

The highest temperature in the tower under normal conditions will be on the feed tray. This particular temperature is a most important control point in separating the oil charge into the desired products.

The vapors which have separated from the hot feed move upward through a series of bubble trays where vaporization and condensation (described in the section on Principles of Distillation) forms the various fractions. The tower is cooled by reflux added to the top tray. Each tray above the vaporizer section is a little cooler than the one next below it, with the coolest tray at the top of the tower. The light material vaporizes and the heavier stock condenses on each tray as the rising vapors bubble through the liquid on each plate up the tower. Homogeneous fractions tend to segregate on each tray and those that are desired are removed from the tower through pipes. These fractions are known as side draws or side streams.

Steam is responsible for the stripping in the bottom section of the tower below the feed tray. That part of the oil that does not vaporize in the flashing chamber collects on the feed tray and overflows through the downpipe to the trays below. The liquid descending from the feed tray may contain some light fractions which have failed to flash out as vapors in the flashing chamber. As the oil flows downward over the bottom trays it contacts steam and oil vapors which bubble through the liquid and strip out the light fractions by lowering the boiling point of the mixture. When it reaches the bottom of the tower it is drawn off as bottom product; is cooled by exchange heat with a cooling medium, and goes on to storage and further processing.



SCHEMATIC DIAGRAM of pipe still. Fig. 3.

... Types of fractionating towers. The fundamental principle of a fractionating tower is to provide for intimate contact of a relatively hot ascending vapor with a relatively cold descending liquid. Most towers are designed with bubble caps and trays to perform this function. This type of tower has been described under "Principles of Distillation." Some towers employ a slat-baffle or disk and doughnut arrangement while others are packed with some base material which leaves a large void space.

The slat baffle and disk and doughnut designs will not approach the fractionating efficiency possible with the bubble-tray type of tower. However, they do find application in cases where fractionating efficiency is not of prime importance. They may easily provide large open areas capable of handling large quantities of liquid and vapor. If coke or other solids are present in the feed, the open areas are large enough that considerable quantities of the solids may be deposited and still not block the flow of liquid and vapors in the tower. When desirable a tower may contain slat baffle or disk and doughnut sections in the lower part of the tower and bubble trays in the upper part.

In the slat-baffle design, the sections are composed of a series of parallel strips of metal, each a few inches wide and spaced to leave open areas between the slats. The slats in each section are so aligned as to be directly over the open areas between the slats in the next lower section. Liquid spills over the edges of the slats and is contacted by the vapor moving upward through the open areas.

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.

by W. L. Nelson
Technical Editor

QUESTIONS ON TECHNOLOGY

Effect of Refinery Capacity on Operating Cost

Have you any information about the operating costs of refineries of different capacity? How much of an advantage does a large refinery offer? S.K.W.B.

Only one set of data has come to the attention of this department, namely, McLean and Haigh[1] and this information is plotted along with other information in Fig. 1. Inasmuch as this is such an important question the author computed the effect of capacity for five different operations.

Two important factors tend to cause the operating cost to decrease at large capacity, namely, investment or financial changes and amount of labor. Both of these factors are influential in all types of refineries but their magnitude is totally different in large-company and small-company refineries. This is clearly evident in Fig. 1. The great differences in labor requirements[2] and in capital investment is indicated in Table 1.

The cost of processing four different crude oils were investigated for the year 1946 and January 1956, and except for differences in the amount of cracking that was needed to fully utilize each crude oil, all of the plants were alike in that the major products were gasoline, diesel fuel or distillate, and fuel oil. Labor and fuel costs were those prevailing on the Gulf Coast. Features of the operations and costs are indicated in Table 2.

Variations in fixed costs were caused mainly by sulfur, octane upgrading especially during 1956, and amount of cracking or the fuel required for cracking. Investment and labor costs were likewise affected by percentage of sulfur (maintenance) and amount of cracking.

Now in answer to the question, among both large and small refiners, the effect of capacity on the operating cost is about as follows, if 20,000 bbl. per day is adopted as the average size of small-company refineries, and 50,000 bbl. per day is accepted as the average size of large-company refineries:

Operating cost*	Capacity—Small	Capacity—Large
10 per cent higher	9,000	22,000
Average	20,000	50,000
5 per cent lower	30,000	75,000
10 per cent lower	50,000	125,000
20 per cent lower		350,000

*Compared with average small-refiner or large-refiner cost.

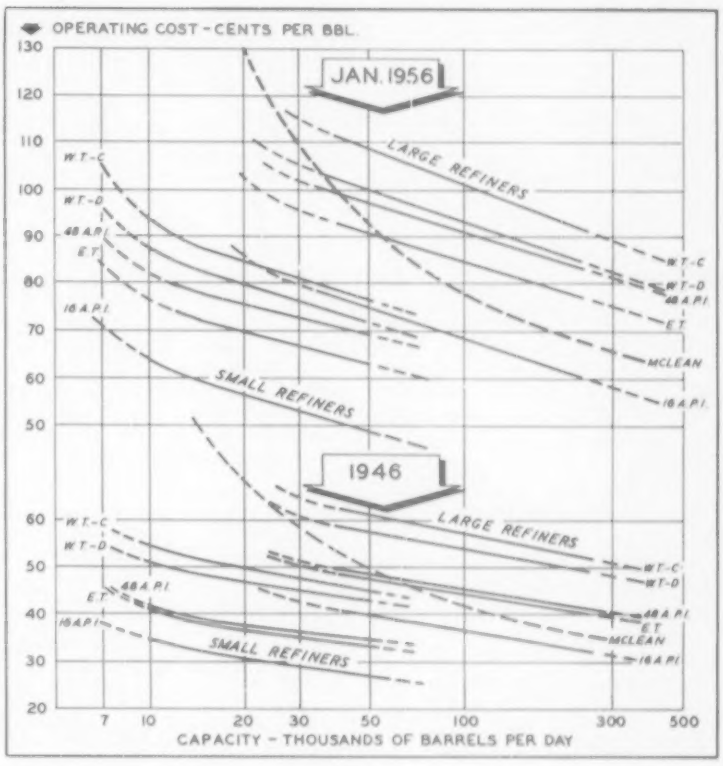


Fig. 1

This checks reasonably well with another independently derived method[3] which states

$$(C_L/C_S)^{0.1n} = O_S/O_L$$

in which C_L and C_S are the capacities of the large (L) and the small (S) plants, "n" is the number of major combination operations, and "O" designates operating cost. In

TABLE 1—MANPOWER AND INVESTMENTS OF LARGE AND SMALL REFINERS

Capacity, B/D	Men per 1,000 Bbl. Cap.—Small Refiner	Men per 1,000 Bbl. Cap.—Large Refiner	Investment—Millions (1946)—Small Refiner	Investment—Millions (1946)—Large Refiner
10,000	18.8		‡$5.0	
20,000	16.7		8.0	
30,000	15.6	†28.0	11.2	‡$17.0
50,000	*13.4	26.2	16.8	25.3
100,000		23.6		44.4
300,000		19.2		105.0

*Extrapolated but one refiner uses only 5 men. †Extrapolated but one refiner uses 31.6 men. ‡92 per cent higher in 1956, i.e., $9,650,000 and $32,800,000.

TABLE 2—OPERATING COSTS FOR THE FOUR CRUDE OILS PROCESSED IN 30,000-B/D REFINERIES (1956)

	Low gravity (Bachaquero)	West Texas Diesel Operation	West Texas Cracking Operation	East Texas	High gravity (Cumarebo)
A.P.I. gravity of crude oil	16.4	36.3	36.3	38.5	47.7
Per cent sulfur	2.02	1.31	(Sour)	0.33	0.07
Percentage cracked	31.6	15.8	29.0	29.8	20.5
Oct. No.—S.R. Gaso.	64.0	47.0	47.0	57.0	58.0
Operating costs—cents/bbl.					
*Fixed—small refiners	12.8	34.5	34.7	30.8	38.4
large refiners	14.1	35.9	36.2	32.1	39.7
†Investment—small refiners	16.3	15.3	16.7	10.7	9.6
large refiners	21.8	20.7	22.2	16.3	15.2
‡Labor—small refiners	23.7	26.4	30.1	25.4	25.0
large refiners	44.0	48.8	56.8	47.1	46.4
§Total—small refiners	52.8	76.2	81.5	66.9	73.0
large refiners	79.9	105.4	115.2	95.5	101.3
¶Standard realization	54.2	86.9	92.0	71.7	79.1

*Fixed charge per barrel capacity (TEL, treating, fuel, etc.). †A charge of 7 per cent for small refiners but only 6.45 per cent for large refiners. ‡$56.75 per week during 1946 and $104 per week during 1956. §No profit or investment retirement. 1946 costs averaged 54 per cent of these (range 50-59 per cent). ¶A standard method mentioned briefly on page 116 of the January 3, 1955, issue of The Oil and Gas Journal. The values shown here do not contain the regular profit item.

this instance only two major operations are involved, namely, topping and cracking, and accordingly "n" has a value of 2.0. The disagreement with the McLean and Haigh[1] results arose because they considered only large refiners, they used much higher plant costs, and because labor was considered as a fixed per barrel cost.

The effect of sourness can be judged by comparing the West Texas costs with those for East Texas or Cumarebo. Sulfur and sourness appear to cost refiners 8 to 20 cents per barrel (1956 and 8-13 during 1946). Financial charges of 7 per cent were used herein and 6 per cent by McLean and Haigh,[1] whereas 4 per cent is a common value for interest alone. A 4 per cent financial charge reduces the operating costs by approximately 6.5 per cent. During the period between 1946 and 1956, inflation in construction costs amounted to more than 9 per cent per year and thus at the end of 10 years the property could be sold for much more than its original cost.

References

1. McLean and Haigh, The Growth of Integrated Oil Companies, Harvard Graduate School of Business Administration, 1954.
2. Nelson, W. L., Refinery Manpower, The Oil and Gas Journal, June 25, 1956, p. 120.
3. Nelson, W. L., Effect of Plant Size on Cost of Operations, The Oil and Gas Journal, Jan. 11, 1951, p. 98.

than the costs related in the news literature for actual plant installations (circle points). All of the points on Fig. 1 are for the year 1946 but an average line (the highest one) for 1956 is also shown. It was obtained by use of the Nelson Construction Cost Index[3] which for 1956 is estimated to be 193. The apparently extreme scattering of the data is not alarming if the many factors that are involved are considered. Among these are:

1. Contractors versus total final installed costs.
2. Costs of major or larger company installations versus small-refiner costs.
3. Vapor pressure of the so-called alkylate which greatly alters the capacity. The capacities in Fig. 1 are true alkylate capacities.
4. Amount of refrigeration employed (in sulfuric acid alkylation).
5. Amount of recycling practiced.
6. Conversion of other (polymerization) equipment to alkylate service.
7. Butylene feed stock versus butylene-propylene feeds.

References

1. Peters and Rogers, New HF Alkylation Process, Pet. Refiner, Sept. 1955, p. 126.
2. Jewell and King, Sulfuric Acid Alkylation . . ., The Oil and Gas Journal, Aug. 16, 1951, p. 120.
3. Nelson Index, The Oil and Gas Journal, July 7, 1952, p. 105. The index also appears in the first issue each month of The Oil and Gas Journal.

Approximate Cost of Alkylation Plants

Can you suggest information on the cost of alkylation plants, and is hydrofluoric acid alkylation cheaper than sulfuric acid alkylation?—M.R.T.

Although the literature[1] seems to indicate that hydrofluoric alkylation is cheaper, for some reason more sulfuric plants than hydrofluoric plants have been installed. However, alkylation is being studied and developed so vigorously that more effective (cheaper) plants may be developing and thus the latest investment costs may be the lowest ones. In the data of Fig. 1, however, the newer plants are not always cheaper.

Only two published articles[1,2] that are available to this department, state investment costs. They both are related to contractor costs, and it is quite evident in Fig. 1 that contractor figures (the "x" points) are lower

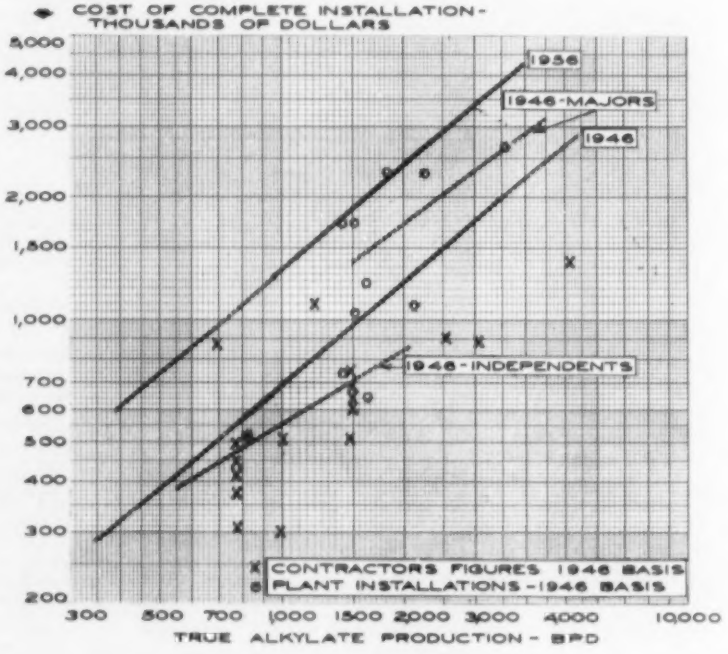
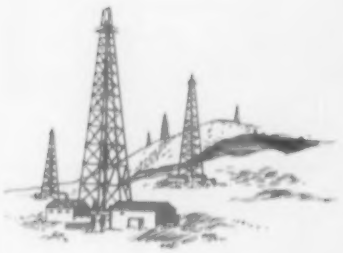


Fig. 1

"Nothing beats a Globe for FAST Digging..."



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ROCK-BIT DESIGN, SELECTION, AND EVALUATION—2

MODERN DRILLING

by H. G. Bentson

What Heat Treatment Does for Rock Bits

EVEN the best materials must be heat-treated properly to produce rock-bit parts with the required physical characteristics. This most critical operation in the manufacture of a rock bit demands constant attention to specifications and quality control.

The major components (cones and journals) on all rock bits are carburized to produce a part with a hard, wear-resistant case (skin) and a tough, shock-resistant core (center section). Specifications and control of the carburizing process are of extreme importance. The amount of carbon added near the surface must be held within narrow limits to obtain the best combination of wear and shock resistance. The depth of carbon penetration determines the so-called "case depth" and must be specified and controlled within close limits for each size and type of cone and journal.

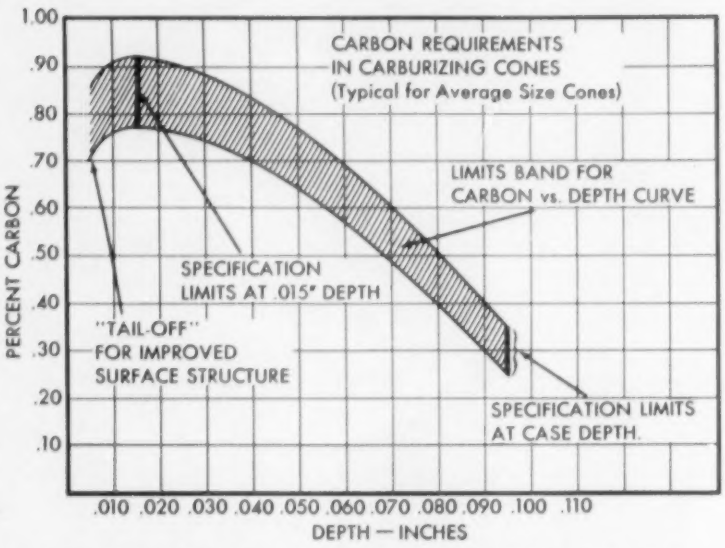
Fig. 2 shows a typical carburizing specification for rock-bit cones. Case depth has been defined by a carbon-content limitation at the specified case depth, and limitations have been imposed on the carbon content near the surface of the cone. Similar specifications are applied to journals; however, in general, journal-case depths are somewhat shallower than cone-case depths.

The extent and depth of the carburized case on cones and journals are shown in Fig. 3.

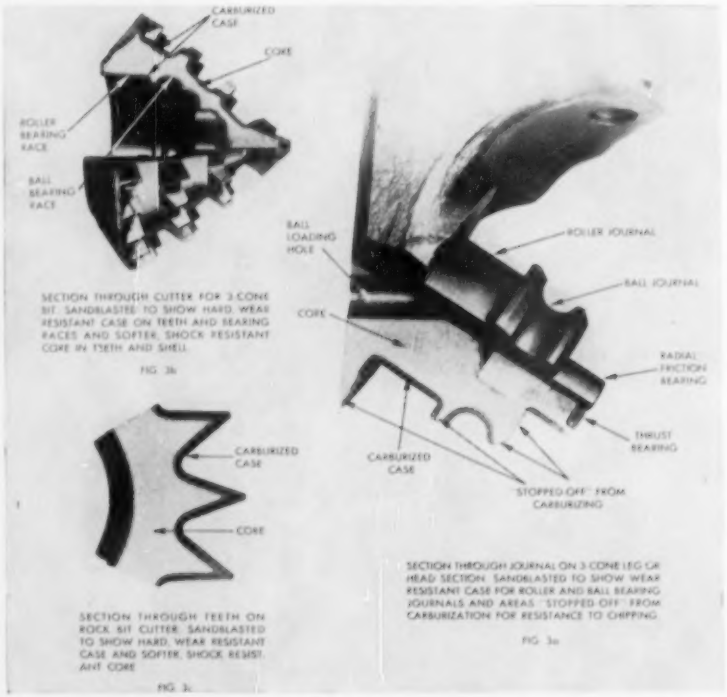
A properly specified and closely controlled quenching procedure is necessary to obtain uniformity in hardness. This is particularly true of hardness at the specified case depth, which cannot be measured on the completed part but which is an important factor in obtaining consistency in performance. The drawing or tempering operation is of importance in retaining surface hardness and optimum residual stresses.

The demand for absolute quality and uniformity of rock-bit components requires complete control of material identification and heat treating at all times during the manufacturing process.

Author is chief sales engineer with H. C. Smith Tool Co., Compton, Calif.



TYPICAL SPECIFICATION CURVE for carburizing rock-bit cones. Fig. 2.


CARBURIZED CASE
CORE
ROLLER BEARING RACE
BALL BEARING RACE
SECTION THROUGH CUTTER FOR 3-CONE BIT. SANDBLASTED TO SHOW HARD, WEAR RESISTANT CASE ON TEETH AND BEARING RACES AND SOFTER, SHOCK RESISTANT CORE IN TEETH AND SHELL.
FIG. 3b
CARBURIZED CASE
CORE
SECTION THROUGH TEETH ON ROCK BIT CUTTER. SANDBLASTED TO SHOW HARD, WEAR RESISTANT CASE AND SOFTER, SHOCK RESISTANT CORE
FIG. 3c
BALL LOADING HOLE
ROLLER JOURNAL
BALL JOURNAL
CORE
RADIAL FRICTION BEARING
THRUST BEARING
CARBURIZED CASE
"STOPPED-OFF" FROM CARBURIZING
SECTION THROUGH JOURNAL ON 3-CONE LEG OR HEAD SECTION. SANDBLASTED TO SHOW WEAR RESISTANT CASE FOR ROLLER AND BALL BEARING JOURNALS AND AREAS "STOPPED-OFF" FROM CARBURIZATION FOR RESISTANCE TO CHIPPING.
FIG. 3a

SECTIONS through rock-bit elements illustrating surfaces carburized. Fig. 3.

Pipeline Patrol

. . . Report on Construction

Under Way, Contracted, and Planned

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way. Uncontracted projects are indicated by • preceding the project.

Crude-Oil Pipelines

Buckeye Pipe Line Co.—Will complete in October or November 1956, own reconditioning of 191 miles of 8-in. from Griffity, Ind., to Lima, Ohio.

• **Gulf Oil Corp.**—Will build 33 miles of 8-in. from Citronelle field to Mobile, Ala., to be completed late summer 1956.

Lakehead Pipe Line Co., Inc.—Anderson Brothers Corp. has under way 51 miles of 26-in. looping from Viking to Plummer, Minn., to complete August 31, 1956. It is in conjunction with 69 miles of 24 and 26-in. to be completed this summer by Interprovincial Pipe Line Co. (See Interprovincial, foreign crude.)

• **Magnolia Pipe Line Co.**—Plans 36 miles of 12-in. from Andrews to Midland, Tex., to be completed January 1, 1957.

• **Mid-Continent Pipe Line Co.**—Plans 10 miles of 6-in. to extend gathering system in Washington and Freeny pools, Oklahoma, to complete in August 1956.

• **Offshore Gathering Corp., Houston.**—Proposes 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana.

• **Pasotex Pipe Line Co.**—Plans 127 miles of 20-in. along its route from Wink to El Paso, retiring another dual 8-in. section, to complete July 31, 1957.

• **Shannon Oil Co., Denver.**—Plans with Farmers Union Central Exchange, Inc., and Mule Creek Oil Co., both of Billings, Mont., a 34-mile, 6-in. line from Murphy Dome in Hot Springs County, Wyoming, to contact Ohio Oil Co.'s line in Big Horn County. Construction to start in August, end by December 1, 1956.

• **Shell Pipe Line Corp.**—Has let contract for 41.5 miles of 10-in. from Shell's Houston refinery to Brookshire Station, to complete by December 1, 1956. Bill Murry is spread superintendent for Bill Murry & Co., contractors. Spread office: 12629 South Main, Houston 25, Tex.

• **Sinclair Pipe Line Co.**—Plans 150 miles of 20-in. from Teague, Tex., to Houston.

• **Tecumseh Pipe Line System.**—190 miles of 20-in. will be built by Sinclair Refining Co., Pure Oil Co., Ashland Oil & Refining Co., between East Chicago and Cygnet, Ohio, to be completed September 1957.

• **Union Oil Co. of California.**—Proposes 815-mile line from Rifle, Colo., to Los Angeles refining area, to carry products from its proposed Rifle shale-oil plant.

Will build 225 miles of 16-in. from San Joaquin Valley to its refinery at Oleum, Calif., to be completed late 1957.

Products Pipelines

• **American Pipe Line Co.**—Received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line from Gulf Coast area to New York City area.

• **Cities Service Oil Co. & Subsidiaries.**—Plans a 10-mile, 6-in. L.P.G. line from Maysville to near Pauls Valley, Okla., to tie in to Shell line moving on to Cushing, Okla.

• **El Paso Natural Gas Co.**—Plans 240 miles of "larger than 6-in." to carry natural gasoline, butane, and propane, from its Midkiff natural-gasoline plant in Permian basin, Midland County, to El Paso. Has under way 96 miles of 8-in. in New Mexico, from its Blanco plant to its Wingate plant.

• **Gulf Refining Co.**—Will build 45 miles of 8-in. from Pontiac Eastern Corp.'s planned refinery at Hattiesburg, Miss. (due on stream May 1957) to a connection with Plantation Pipe Line Co.'s system. No date set to start.

Magnolia Pipe Line Co.—Plans a 30-mile, 8-in. line from Andrews to Dollarhide, Tex., to complete January 1, 1957, and an L.P.G. line, 19 miles of 6-in., 3 miles of 4-in. from Beaumont to Orange, Tex. Brown & Root has under way a 75-mile, 8-in. L.P.G. line from Hull to Texas City, Tex., to complete January 1, 1957.

• **Mid-Continent Pipe Line Co.**—Has let contract to E. Voigt, Inc., for 12 miles of 4-in. to connect natural gasoline plant at Fox, Okla. Completion is scheduled for August 1956.

• **Phillips Chemical Co.**—Panama Williams Corp. has contract to build 76 miles of 6-in. from Pasadena to Sweeny, Tex., for L.P.G., to complete by September 1, 1956. Spread office is in South Houston, and W. H. Shiplett is spread superintendent.

• **Phillips Petroleum Co.**—Plans 15 miles of 6-in. L.P.G. line in Sweeny, Tex., area, to be completed September 15, 1956.

• **Phillips Pipe Line Co.**—Plans 135 miles of 12-in. looping between Borger, Tex., and St. Louis, Mo., to be completed December 31, 1956.

Plantation Pipe Line Co.—Oklahoma Pipe Line Constructors has under way 327 miles of 18-in. from Baton Rouge to Helena, Ala., to complete December 1956. N. L. Arie, spread man, office at Baton Rouge.

• **Shell Oil Co., Pipe Line Department, Pacific Coast.**—Plans to convert 13 miles of existing 4-in. gasoline line, and add 3 miles of new line, to move gasoline from Wilmington refinery to Los Angeles. To be completed January 1, 1957.

• **Sioux Oil Co.**—Plans 80 miles of 4-in. from its Newcastle, Wyo., refinery to Rapid City, S. D., to be completed late 1956.

• **Sohio Petroleum Co.**—Plans 37 miles of 8-in. from Mogadore to Girard, Ohio, to complete November 1, 1956.

• **Southern Pacific Pipe Lines, Inc.**—Plans a 300-mile line to span the Sierras and connect San Francisco with Reno and Fallon, Nev., and to serve the Sacramento Valley.

Sun Pipe Line Co.—Contracts let on 109 miles of 14-in. from Twin Oaks, Pa., to Newark, N. J.: Sheehan Pipe Line Construction, 90 miles from Twin Oaks to Plainfield, N. J., J. W. Brown, spreadman, office at Malvern, Pa.; Delaney-Missouri Valley Construction Co., remainder. Missouri Valley Dredging Co. has river crossings at Delaware, Schuykill, and Raritan rivers. Work started

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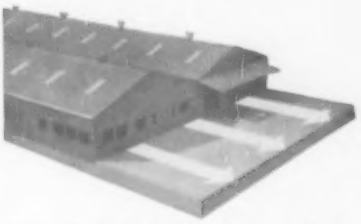
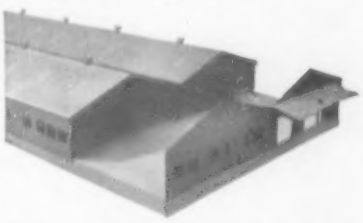


Business expansion can be expensive—if it's not planned for. But when you choose a Butler building, you get "built-in" provision for expansion . . . fast . . . in any direction . . . usually at lower cost than initial construction.



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Pipeline Patrol

May 1, to end September 1956. Line replaces present 8-in. line.

• **Sunflower Pipe Line System.**—Has Kansas Corporation Commission approval for 215 miles of 6-in. to move L.P.G. from six counties in western Kansas to Wichita.

Non-Petroleum Pipelines

• **American Gilsonite Co.**—Plans 70 miles of 6-in. from Bonanza, Utah, to Grand Junction, Colo., to carry slurry of gilsonite from mines to refinery now being built.

Pittsburgh Consolidated Coal Co.—Let to Williams Brothers, 108 miles of 10-in. from its mines in eastern Ohio to Cleveland Electric Illuminating Co.'s Eastlake power plant northeast of Cleveland. Work started April 1, 1956, on this first line to move coal, with Ford, Bacon & Davis, Inc., handling specifications, contracts, construction supervision.

Natural-Gas Pipelines

American Louisiana Pipe Line Co.—Let bulk of 1,160-mile line from North Tepetate, La., to Detroit. H. C. Price and Houston Contracting Co. have 770 miles of 30-in. from near Willow Run, Mich., to near Eudora, Ark.

Houston has completed over half of 40-mile section in Ohio, E. C. Norris, spread superintendent, office in Van Wert; has completed over half of a 100-mile section from east of Memphis, Tenn., working south toward Eudora, Ark., W. H. Hayes, spread superintendent, office at Senatobia, Miss.; has completed over half of 85-mile section working north from Eudora, F. A. Silar, spread superintendent, office at Cleveland, Miss. Houston's work to be completed early August 1956.

Price started May 1 on 83 miles in Tennessee, R. L. Ezell, spread superintendent, office at Brownsville, Tenn.; 31 miles in Indiana, C. E. Shivel, spread superintendent, office at French Lick, Ind.; 83 miles in Kentucky, C. R. Ice, spread superintendent, office at Princeton, Ky.; 31 miles in Indiana, W. H. Olrich, spread superintendent, office at Edinburg, Ind.

Brown & Root has 221 miles of 30-in. from North Tepetate to Arkansas-Louisiana border (which is subcontracted to Associated Pipe Line Contractors and Western Contractors), and 39 miles of 16-in. under-water line which it will lay itself. Western Contractors expects to complete its 100 miles August 1956. W. B. Williams, spread man, office at Eunice.

Houston Contracting Co. and H. C. Price Co. will start early August 1956 on 121 miles of 22-in. from Payne, Ohio, to Bridgman, Mich. Houston will lay 75 miles on eastern section, E. C. Norris, spread man; Price will lay 46 miles on the west. Work to end fall 1956.

Plans 21 miles of 24-in. from Tepetate to Lewisburg, La., starting July 15, ending summer 1956.

• **Arkansas Louisiana Gas Co.**—Has long-range plans for line from Texas-Louisiana coastal region to northern Louisiana, to connect with their present system.

Atlantic Seaboard Corp.—Williams-Austin Co. has under way 50 miles of 24-in. from Hardy County, West Virginia, to Greene County, Virginia, O. L. Martin, spread man, office at Elkton, Va., and 32 miles of 26-in. loops along the Cobb-Rockville line in West Virginia. Ralph Gaddy, spread man, office at Elkins, W. Va., both to be completed November 1, 1956.

• **Carolina Pipeline Co.**—Has received South Carolina Public Service Commission permit to distribute gas in central South Carolina. Plans lines to 14 cities. Will buy gas from Transcontinental Gas Pipeline Co. or Southern Natural Gas Co.

• **Cities Service Gas Co.**—Plans 12 miles of 30-in. and 17 miles of 20-in. between Oklahoma City and Mulhall, Okla., to be completed October 1, 1956.

Prairie Construction Co., Inc., has 28 miles of 16-in. between Leavenworth, Kans., and St. Joseph, Mo., to complete August 15, 1956; 9 miles of 16-in. near Springfield, Mo., to complete October 1, 1956; 4 miles of 12-in. from Johnson County to Lafayette County, Missouri, to complete September 1, 1956.

• **Coastal Transmission Corp.**—Applied to FPC for 565 miles of 22-26-in. from McAllen, Tex., to Baton Rouge, to deliver to Houston Texas Gas & Oil Co.'s proposed line to Florida. Plans 272 miles of smaller gathering lines.

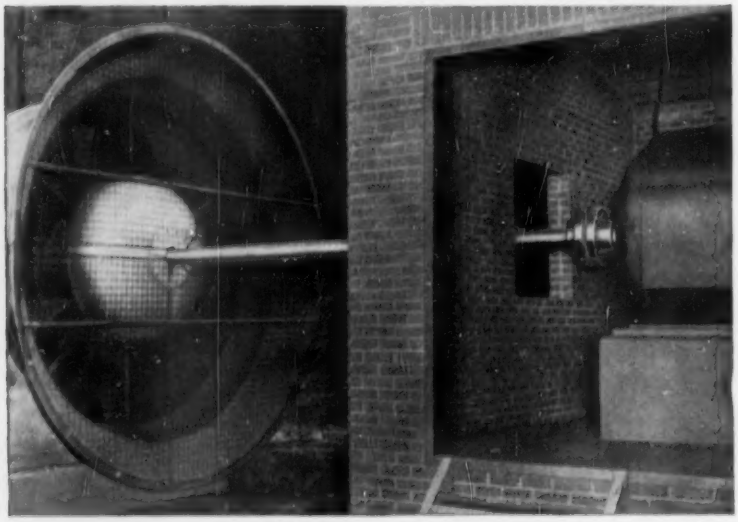
• **Colonial Natural Gas Corp.**—Proposes two systems: One between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.

• **Colorado Interstate Gas Co.**—R. H. Fulton has 238 miles of 22-in. from Laramie to Green River, Wyo. (last part of a 374-mile line between Denver and Rock Springs), to be completed fall 1956. Filed March 29, for FPC permit for 1957 program: 307 miles of 30-in. from Idalia, Colo., to Beatrice, Neb., to take gas from a planned 165-mile, 26-in. line from near Carr, Colo., to Idalia, and from a 72-mile, 26-in. line from near Kit Carson, Colo. to Idalia; 215 miles of 20 and 24-in. to parallel present line from Texas Panhandle area to Kit Carson; 34 miles of 16-in. from Keyes field, Oklahoma, and Greenwood field, Kansas, to the new north-south line.

• **Colorado-Wyoming Gas Co.**—Plans 11 miles of 16-in., 2 miles of 12-in., and 2 miles of 8-in. looping north of Denver, to be completed November 1956.

• **Crown Central Pipe Line Co.**—Plans 6

Eliminate Intermediate Bearings!



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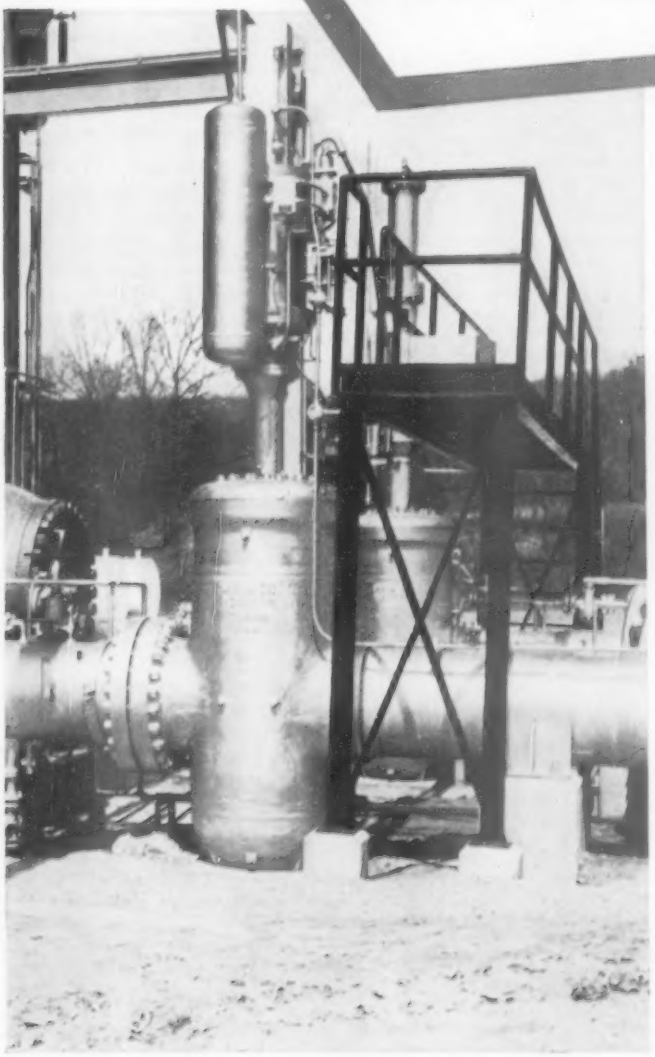

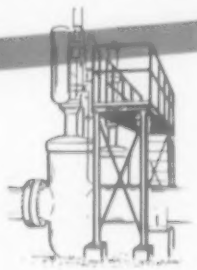

Completely dependable valve operation is of the utmost importance in this remotely controlled, fully automatic compressor station. These valves, operated from a station 80 miles distant, must open or close at the push of a button. The parallel expanding gate in W K M valves is the best possible insurance for dependable operation. Before moving into open or closed position, the gate segments are positively contracted by the exclusive LEVERLOCK and held in this position, assuring free and easy movement of the gate. Expansion of the gate segments against both upstream and downstream seats provides a positive double seal. Their Through-Conduit provides full volume, free flow . . . offers no more pressure drop than an equivalent length of pipe . . . sets up no turbulence. The right ratio of port opening to closing speed prevents dangerous line surges.

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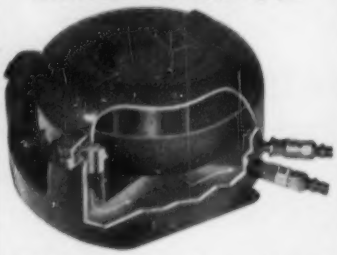

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Pipeline Patrol

miles of 4-in. Vermilion Parish, Louisiana, to be completed August 15, 1956.

El Paso Natural Gas Co.—Has under way 193 miles of 34-in. between San Juan basin and Topock, Ariz., and 38 miles of 20-in. between San Juan mainline and Phoenix, both to be completed February 1, 1957. Western Pipeline, Inc. has under way 146 miles of 34-in. between San Juan basin and Topock, to be completed February 1, 1957, and 112 miles of 20-in. between San Juan mainline and Phoenix, to be completed November 1, 1956. El Paso also has under way 34 miles of 24-in. from Ignacio, Colo., to the Blanco plant, to be completed October 1, 1956.

Filed June 1956 for FPC permit for 888 miles of field and main lines in Texas, New Mexico, and Arizona.

• **Empire Southern Gas Co.**—Groninger & King Construction Co. has a 4-mile, 8-in. loop south out of Pampa, Tex. A 9-mile, 8-in. loop northwest out of Big Spring, Tex., to be completed September 1, 1956, not let.

• **Hope Natural Gas Co.**—Plans 22 miles of 8-in. in Logan County, West Virginia, and 20 miles of 3 to 8-in. in various West Virginia counties, to be completed in 1956.

• **Houston Texas Gas & Oil Co.**—Applied to FPC for 960 miles between Baton Rouge and Miami: 507 miles of 30-in., 157 miles of 26-in., 61 miles of 20-in., 224 miles of 18-in., 12 miles of 12-in. Plans 500 miles of sales laterals in Florida, with main line joining Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.

• **Iron Ranges Natural Gas Co., St. Paul.**—Applied to FPC for a 68-mile transmission line and 47 miles of laterals to supply towns on the Mesabi Iron Range, Minnesota.

• **Kansas-Nebraska Natural Gas Co., Inc.**—Has FPC permit for 11 miles of 12-in. from Colby to Oakley, Kans., to be completed August 1956. Plans 10 miles of 10-in. and 10 miles of 8-in. from Grand Island to Albion, Neb., to be completed November 1956.

• **Lone Star Gas Co.**—Has two plans before FPC to enlarge system in Texas and Oklahoma: one is a 230-mile line from Cotton County, Oklahoma, to Fritch, Tex.; one is a 205-mile line from Snyder, Tex., to a hookup with the Cotton-Fritch line. Plans are attempt to keep Natural Gas Pipeline Co. of America from building line from Wise County, Texas, to Fritch.

Michigan Consolidated Gas Co.—Somerville Construction Co. has under way 67 miles of 10 and 12-in. between Sears and Travers City, Mich., Floyd Huduall, superintendent, office at Cadillac. Somerville, jointly with H. L. Gentry Construction, has under way 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich., Frank Morris, superintendent, office at Hart.

• **Michigan Wisconsin Pipe Line Co.**—Has FPC permit for 252 miles of 24, 18, 12, 6, and 4-in. loops in Wisconsin, to be completed November 1956.

Latex Construction Co., jointly with Houston Construction Co. and H. C. Price Co., has 90 miles of 16 and 20-in. between Milwaukee and Oshkosh, to start June 25 and complete October 1, 1956, John Phipps and U. J. Davenport, spread men, office at Fond du Lac.

H. C. Price Co. and Houston Contracting Co. will build 149.4 miles of loop lines in Wisconsin and Illinois. Price will construct 56 miles of 24-in., and Houston will build 42.4 miles of 20-in. and 51 miles of 16-in.

• **Midwestern Gas Transmission Co.**—Will build a main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in. Plans 648 miles of 3 to 18-in.

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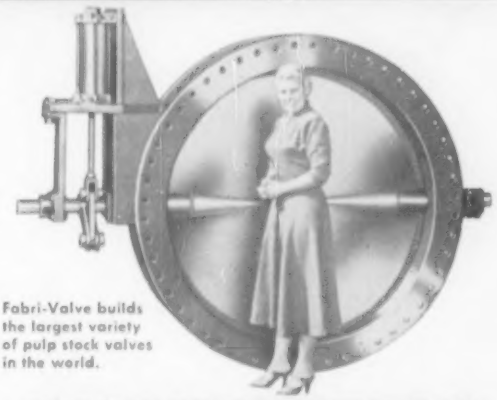

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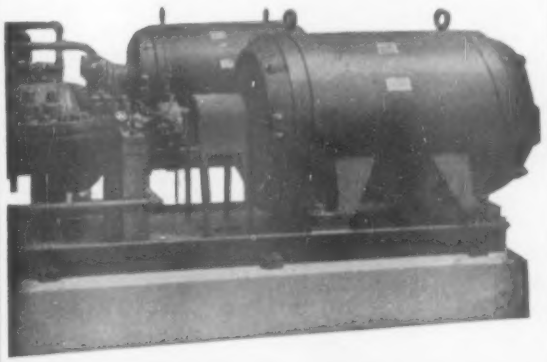

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Pipeline Patrol

extensions in Minnesota and Wisconsin, pending FPC approval.

• **Montana-Dakota Utilities Co.**—Awarded contract to Ross Powers Construction Co., Billings, Mont., to start in August 1956, on 28 miles of 12-in. from Fallon County to Dawson County, Montana.

• **Natural Gas Pipeline Co. of America.**—Has FPC approval for 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex., which will be contested by Natural Gas Pipeline and Lone Star Gas Co. Filed for FPC permit for a 389-mile, 36-in. loop along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co. Also for 91 miles of 30-in. looping to be laid along parts of its main line.

New York State Natural Gas Corp.—Williams-Austin Co. has 17 miles of 30-in. from Caton to Horseheads, Steuben County, New York, starting August 1, to complete November 1, 1956.

Niagara Mohawk Power Corp.—Let to various contractors, 275 miles of 2 to 12-in. distribution mains for growth of service areas in Central, Eastern, and Northern New York, to be completed December 31, 1956.

• **North Carolina Natural Gas Corp.**—This subsidiary of Colonial Natural Gas Corp. has permit from North Carolina Utilities Commission for 575 miles of 3 to 16-in. from Transcontinental Gas Pipe Line Corp.'s system near Mooresville, eastwardly across North Carolina.

• **Northern Natural Gas Co.**—Applied to FPC to add 348 miles of main line, 307 miles of branch lines in Wisconsin, Minnesota, South Dakota, and Iowa. Main lines include 169 miles in Duluth-Superior area, 164 miles in Aberdeen area of South Dakota.

R. H. Fulton & Co. has 28 miles of 20-in. from Redfield to Ogden, Iowa; Beaver Creek and North Racoon crossings; 15 miles of 24-in. north and south of Hooper, Nebraska.

Pentzien, Inc., has 24-in. Elkhorn River crossing.

Plans 73 miles of 20-in., Savanna Creek to Pincher Creek fields in Alta., Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.

• **Offshore Gathering Corp., Houston.**—Seeks FPC permit for 364 miles in Gulf of Mexico off Louisiana: 60 miles of 24-in.; 70 miles of 26-in.; 234 miles of 30-in.

• **Pacific Gas & Electric Co.**—Will build 37 miles of 20-in., 37 miles of 18-in., 9 miles of 12-in. from Beehive Bend field near Willows, Calif., to near Davis, then to Sacramento. Has under way a 6-mile gathering system at Beehive Bend. Also plans to loop the Topock-Milpitas line with 135 miles of 34-in., laying major part in 1956, and 67 miles in 1957. A joint-venture firm, Midwestern-Johnson-Dixon, has 85 miles of this to complete in 1956.

• **Pacific Northwest Pipeline Corp.**—Has FPC permit for 37 miles of 6-in. from Dove Creek, Colo., to Nucla, and 13 miles of 4-in. from Nucla to Uravan, to serve Union Carbide Nuclear Co. and Vanadium Corp. of America. Work under way on other trunk and sales laterals:

R. H. Fulton & Co., 156 miles 20 and 16-in. lateral from main line to Spokane; also 129 miles of laterals into Idaho, to complete fall 1956.

• **Permian Basin Pipeline Co.**—R. H. Fulton & Co. has 19 miles of 16-in. in Andrews County, Texas.

• **Phillips Chemical Co.**—Plans 79 miles of 6-4-in. ethylene line from Sweeny to Pasadena, Tex., to be completed December 31, 1956.

• **Piedmont Gas Co., Hickory, N. C.**—

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Pipeline Patrol

(Parent is Carolina Natural Gas Corp.) Seeks FPC permit for 78 miles of 2 to 8-in. extension off Transcontinental in North Carolina, to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.

Portland Gas & Coke Co.—United Engineers & Constructors, Inc., of Philadelphia, has engineering contract for 80 miles of various size lines up to 16-in.

Signal Oil & Gas Co.—C. P. Bartley & Son has 70 miles of 2 to 16-in. gathering system near Tioga, N. D., to be completed September 1, 1956. C. P. Bartley, Jr., and Lawrence Barto, spread men, office at Tioga.

• **Southern California Gas Co. and Southern Counties Gas Co. of California.**—Have permit for 239 miles of 30-in. from Topock, Ariz., to Newhall, Calif., to start November 1956, to complete 1957.

Also building 49 miles of 30-in. from Newhall to Alhambra, Calif. Work is under way by: Alex Robertson Co., 13 miles; Macco Corp., 16 miles; Joe E. Young Contractors, Inc., 19 miles. To be completed December 1, 1956.

• **Southern Natural Gas Co.**—Has temporary FPC authority for 39 miles of loops near Atlanta, Ga.

• **Tennessee Gas Transmission Co.**—1—Bechtel Corp. has 74 miles of 30-in. looping from Glasgow to Danville, Ky., to complete by October 1, 1956, Joe L. Work, spread man, office at Greensburg, Ky.

2—142 miles of 26-in. looping in Ohio, to be completed fall 1956, under contract to: H. C. Price, 81 miles from near New Boston to near McConnelsville, G. A. Reutzel, spread man, office at Chauncey; Oklahoma Construction Co., 61 miles from near Newcomerstown to near Lisbon.

3—Has FPC permit for 63 miles of 30-in. looping from Scottsville, Ky., to Cave City, and from southwest of Danville to northeast of Danville.

4—Has FPC permit for 99 miles of 26-in. looping from Greenup, Ky., to north of Ohio River, from McConnellsville to Newcomerstown, and from Lisbon, Ohio, to near Mercer, Pa.

5—Seeks FPC permit for 100 miles of 4, 6, 8, 10, and 12-in. gathering line in Texas-Louisiana Gulf Coast area.

• **Texas Eastern Transmission Co.**—Applied to FPC, December 1955, for 422-miles of 30-in. from McAllen to Beaumont, Tex., to move imported Mexican gas. Applied for 530 miles of 30-in. looping from Kosciusko, Miss., to Uniontown, Pa. Will lay 45 miles of 24-in. from Provident City, Tex., to connect in Matagorda County, Texas, to tie the Wilcox Trend Gathering System with the extension from Mexico.

Texas Gas Transmission Corp.—Houston Contracting Co. has 53 miles of 30-in. looping from Chicot, Ark., to Clarksdale, Miss., to complete August 31, 1956; 108 miles of 20-in. and 3 miles of 12-in. from Eunice to Lake Palourdes, La., to complete December 20, 1956; 11 miles of 16-in. loops near Roanoke, La., to complete October 20, 1956; 2 to 16-in. Atchafala River crossing near Morgan City, La., to complete September 1, 1956; 22 miles of reconditioning of 18-in. near Wilmot, Ark., and Clarksdale, Miss.

Union Construction Co. has under way 21 miles of 12-in. from Petersburg to Bicknell, Ind., to complete August 15, 1956.

Pentzien, Inc., has Mississippi River crossing near Greenville, Miss., to complete December 15, 1956.

• **Texas Eastern Transmission Corp.**—Has FPC approval to build 11 miles of 12-in. in Philadelphia area.

• **Trans Carolina Pipe Line Corp., Commercial Building, Raleigh, N. Car.**—Seeks FPC permit for 300-mile system across North

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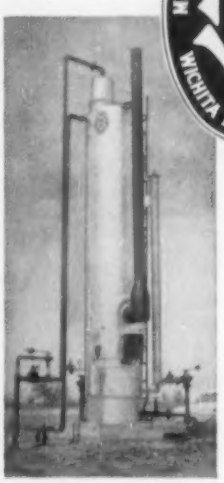

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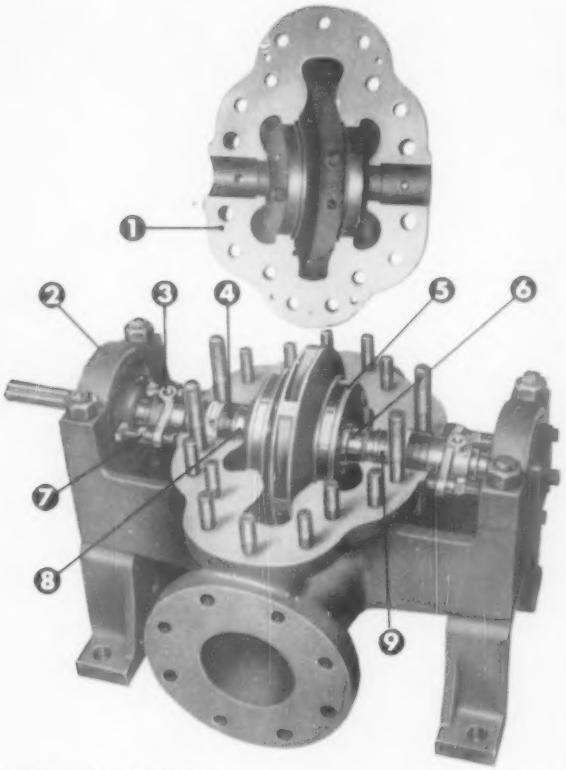

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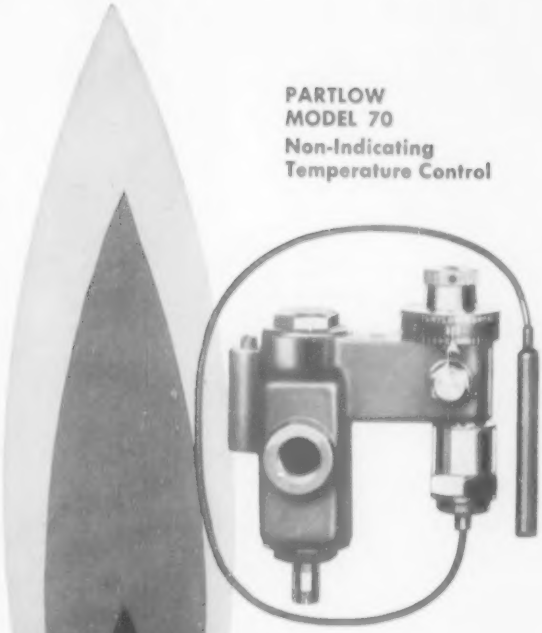

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Pipeline Patrol

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• **Transcontinental Gas Pipe Line Corp.**—Has applied to FPC to lay 160 miles of 36-in., 67 miles of 30-in., and 24 miles of 24-in. loops from Louisiana to Pennsylvania, to be completed December 1, 1956; 25 miles of 36-in. loops from Louisiana to South Carolina, to lay in 1957.

• **Washington Gas Light Co.**—Has FPC approval to construct 26.1 miles of 24-in. and 2.7 miles of 20-in., from Dranesville, Va., to Washington, D. C.

Winchester and Vienna, Ill., Cities of—M. L. Hulcher Co., Inc., has 21 miles of 8-in. for Winchester, to complete September 30, 1956, Rolfe, superintendent; has 10 miles of 4-in. for Vienna, to complete August 15, 1956, Wilkerson, superintendent.

Foreign Crude-Oil Pipelines

Arabian American Oil Co.—Firm is building a 140-mile, 20-in. line from Safaniya field to Ras Tanura.

• **Canadian Gulf Oil Co.**—Seeks approval for 35 miles of 8-in. to connect Drumheli field, Alberta, with existing Gulf lines running to Edmonton.

Cremona Pipe Lines, Ltd. — Dutton-Williams Brothers, Ltd., has 78-mile, 8-in. line from Sundre-Westward Ho region to Calgary, to be completed August 1956. Company is subsidiary of Home Oil Co. Spread office is in Calgary, and F. Peters is spread man.

Gulf Italia Co.—Will complete late summer 1956, 35 miles from its Ragusa field in southwestern Sicily to RASIOM's refinery at Augusta.

Interprovincial Pipe Line Co.—Majestic Contractors, Ltd., has under way 67 miles of 24-in. between Carroll and Somerset, Man.; 2 miles of 26-in. between U. S. border and Gretna pumping station, to complete August 31, 1956.

Has applied to Board of Transport Commissioners for 151 miles of 20-in., an extension of its line from Sarnia to Port Credit, Ont. If approved, work will start spring 1957, end that fall.

• **Mene Grande Oil Co.**—Plans 11 miles of 6-in. from Elias to Fria, and 10 miles of 10-in. from Limon to Leona-Dacion Lateral, Venezuela, to complete first quarter 1957; 24 miles of 12, 14, 16-in. from Oficina Tank Farm to Oveja, to complete in 1956.

Peace River Oil Pipe Lines, Ltd.—Fulton Banister, Ltd., has contract to coat and bury 45 miles of 12 and 16-in. from Valleyview to Edson, Alta. (Line was welded above ground last year). Jerry Nash is superintendent, office at Valleyview.

Pembina Pipe Line, Ltd.—Sparling Davis Co., Ltd., has 100 miles of 3 to 10-in. gathering system in Pembina field.

Mannix, Ltd., has 200 miles of 3 to 12-in. gathering lines in Pembina field, F. Whitlow, superintendent, office in Pembina field.

PEMEX.—Constructora El Aguila, S. A., has 50 miles of 20-in. from Angostura to Veracruz, Antonio Sanz Polo, spread man, office at Veracruz.

• **Rangeland Pipeline, Ltd.**—Will build 17 miles of 6-in. and 16 miles of 4-in. from west end of Joffre field to connect West Gilby; 10 miles of 12-in. from Gilby Junction to Rimbey field, Alberta. Work to be completed fall 1956.

• **Royal Dutch-Shell**—Together with several other companies, is considering 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, the Netherlands, and Belgium. Main trunk would be 30-in.

• **Sinclair Oil Corp. and Socony Mobil Oil Co.**—Will build 211 miles of 20-in. from

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Pipeline Patrol

the Silvestre field in Barinas, Venezuela, to Puerto Cabello on Caribbean Sea.

• **South Saskatchewn Pipe Line Co.**—Building 58 miles of 12-in. from Cantuar field to Dollard field in Saskatchewan, to be completed September 1956.

• **Texaco Exploration Co.**—Plans 22 miles of 12-in. and 3 miles of 8-in. between Westerose and Rimbey pools, Alberta, Can.

Union of Soviet Socialist Republic.—Has under way a 2,300-mile Trans-Siberian crude and products system from Ufa and the Tuimaza fields in Bashkiria to Irkutsk near Lake Baikal.

Westspur Pipe Line Co.—Majestic Contractors, Ltd., has 109 miles of 12-in. from Midale, Sask., to Interprovincial Pipe Line Co.'s pump station at Cromer, Man., and 50 miles of various size gathering lines in Midale-Frobisher area, to complete fall 1956.

Yacimientos Petroliferos Fiscales (Argentina).—Has started 700 miles of 12-in. from Campo Duran to San Lorenzo. TECHINT, (Compania Tecnica Internacional), Buenos Aires, has 90 miles.

Yacimientos Petroliferos Fiscales Bolivianos (Y.P.F.B.)—Williams Brothers Co. has 160 miles of 10-in. and 43 miles of 8-in. from Sicasica to Arica on the Chilean coast, to be completed December 1957.

Foreign Products Pipelines

• **Estrada de Ferro Santos a Jundial Departamento Oleoducto.**—Plans 6 miles of 14-in. from the Capuava Refinery to Utinga Terminal, to be completed December 1956.

Hydrocarbons Pipeline Co. (subsidiary of Canadian Hydrocarbons)—Has permit from Parliament of Canada to build 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Ft. William, Ont. If approved by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board, work will start early 1957. Williams Brothers, Calgary, and A. D. Little and Co., Boston will act as construction consultants.

• **Imperial Oil, Ltd.**—Will lay 38 miles of 12-in. loop along present line from Waterdown, Ont., to Toronto.

• **Iraq Petroleum Co., Ltd.**—Plans 75 miles of 24-in., 180,000-bbl. daily capacity, from Homs, Syria, to Tripoli, Lebanon.

National Iranian Oil Co.—Contracts let on 573 miles of 10-in., 40,000-bbl. daily capacity, from Ahwaz to Teheran, Iran; Constain-John Brown, Ltd., London, and Williams Brothers Co., started February 1956, laying southern 337 miles; Enterpose of Paris, has northern 236 miles.

• **North Atlantic Treaty Organization (NATO).**—Laying 2,000 miles of lines to airfields in parts of Europe. Associated Pipeline Contractors, Inc., has 450 miles from Iskenderun, Turkey, to Batman. TECHINT (Compagnia Tecnica Internazionale), Milano, Italy, has 205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir. Bids were taken in January 1956, on 300 miles of 12-in. between Marseille and Langres, France.

PEMEX.—Constructora El Aguila, S. A., has 155 miles of 12-in. from Tampico to Cd. Victoria, Geronimo Aviuchastegui, spread man, office at Tampico.

The United States Defense Department.—Sponsoring 485 miles of 8, 10, 12-in. from Cadiz to Zaragoza, Spain. Contracts let to Merritt Chapman & Scott; Benson & Montin of Oklahoma City; Agroman Construction Co. of Spain. Prime contractor is Brown-Raymond-Walsh.

Yacimientos Petroliferos Fiscales Bolivianos (Y.P.F.B.)—Williams Brothers Co. has 190 miles of 4-in. from Camiri to Santa Cruz, to be completed December 1956.

Foreign Natural-Gas Pipelines

• **Alberta Gas Trunk Line Co.**—Plans 547 miles of gathering system for the Trans-Canada line. About 40 miles of 34-in. will be laid in 1956 to connect Bindloss field. Remainder to be laid in 1957 and 1958. Fields to be connected are Pincher Junction, Provost, Sibbald, Oyen, Sunnynook, Steveville, Cessford, Countess, Dutchess, Princess, Homeglenn, Rimbey, Nevis.

Andes Pipeline Corp.—This subsidiary of Glenn McCarthy, Inc., will build and operate 500 miles of 12-in. from McCarthy's Bolivian concession to the Chile copper mining area.

Attock Oil Co.—Plans 60 miles from Dhulian field to Rawalpindi in West Pakistan.

B. C. Electric Co., Ltd.—Mannix, Ltd., has 10 miles of 18-in. and 20-in. in vicinity of New Westminster, B. C. to complete in October 1956. D. Graham, 546 Howe Street, New Westminster, is spread man.

• **Canadian Gulf Oil Co.**—Has let contract for 10 miles of 8-in. and 12-in. near Pincher Creek, Alta., to Dutton-Williams Brothers, Ltd. Spread office is in Pincher Creek.

Cia. Shell de Venezuela.—Plans 177 miles of 20-in. from La Paz field in the Maracaibo district, to the Cardon refinery on Paraguana Peninsula, to fuel refinery furnaces. To be completed in 1957.

• **Empresa Nacional del Petroleo.**—80 miles, 10-in., planned, Concon to Santiago, Chile.

• **Estrada de Ferro Santos a Jundial Departamento Oleoducto.**—Plans 16 miles of 6-in. from Cubatao refinery to Elcloro plant, to be completed December 1956.

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Pipeline Patrol

• **Gas Industrial de Monterrey.**—Plans 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey in northern Mexico.

Imperial Oil, Ltd.—Has let 65 miles of 4 to 16-in. gathering system in Redwater area of Alta., to Majestic Contractors, Ltd.

• **Magna Pipeline Co.**—Plans to complete fall 1956, an underwater line from Anacortes or Bellingham, Wash., to Victoria.

New British Dominion Oil Co.—Started June 22 on a 46-mile line from Etzikom gas field to Medicine Hat, Alberta, to be completed mid-August 1956.

North Canadian Oils, Ltd.—Dutton-Williams Brothers, Ltd., has 136 miles of 10-in. from Lake Wabumun to Hinton, Alta., to be completed August 1956, L. A. Stewart, spread man, office at Onoway, Alta.

PEMEX—Plans starting July 1956, on 22-in. line between Reynosa and Monterrey.

• **Rangeland Pipeline Co.**—Has let contract for 44 miles of 4-in., 6-in., and 12-in., from Red Deer to Rimbey, Alta., to Dutton-Williams Brothers, Ltd., for October 1956 completion.

Saskatchewan Power Corp.—Fulton Banister, Ltd., has 229 miles in Saskatchewan, Jerry Nash, general superintendent; 115 miles of 12-in. from Success to Moose Jaw, starting July 15, to complete September 1, 1956, office at Swift Current; 53 miles of 6-in. from Biggar to North Battleford and 30 miles of 8-in. from Dana to Humboldt, completed; 17 miles of 10-in., 8 miles of 6-in., and 6 miles of 4-in. Hoosier extension and gathering lines from Brock field to Eston Transmission lines, to complete October 1, 1956, office at Kindersley.

South Alberta Pipe Line, Ltd.—Filed permit for 150 miles of 8-in. from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta.

Sui Gas Transmission Co.—Pakistan Constructors, a joint company of Morrison-Knudsen of Boise, Ida., and William Press, Ltd. of London, have 188 miles of 16-in. from Sui gas field to Moultan, Pakistan. Work begins mid-1956. Line to be extended later to Lahore with branches at Kot Addu, Jhang Magiana, and Montgomery.

• **Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venezuela.**—Proposes a 321-km., 26-in. line from Anaco to La Mariposa near Caracas.

• **Trans-Canada Pipe Lines, Ltd.**—Work begins July 1, 1956, on 574 miles of 34-in. from the Alberta-Saskatchewan border to Winnipeg. Contracts let on first four sections to: Majestic Contractors, Ltd.; Canadian Bechtel, Ltd.; Mannix Ltd.; Dutton-Williams Brothers, Ltd. Three sections still to be let. Completion of this stretch planned for December 1, 1956. This is the first stretch of a 2,250-mile line from Alberta to Toronto and Montreal. Deadline for exporting gas from Alberta is December 31, 1957. Tennessee Gas Transmission Co. has proposed a line to take the gas at Emerson, Man. (See Midwestern Gas Transmission Co.).

Westcoast Transmission Co., Ltd.—Has let 650 miles of 30-in. from Peace River area Canada, to Sumas, Wash. Dutton-Williams Brothers, Ltd., has 120 miles from Taylor, B. C., to Azouzetta Lake, to be completed September 1957, O. Graves, spread man, office at Dawson Creek, B. C.

Mannix, Ltd., has 110 miles between Huntingdon and Merritt, Fred Byers, superintendent, office at Chilliwack.

Canadian Bechtel, Ltd., construction division, has 210 miles from Alexandria to Pine Pass, B. C. to complete September 15, 1957. H. F. (Hank) Mogg, spread man, office at Quesnel, B. C.

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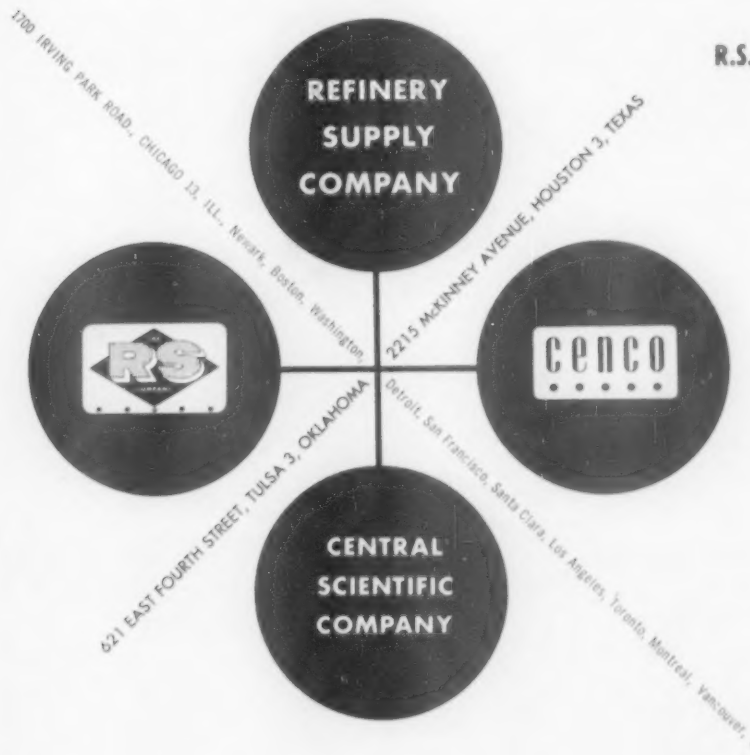
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Highly effective equipment in the constant quest for black gold are the massive off-shore oil drilling rigs, now operating in several Gulf of Mexico locations. On these, crews are living and working many miles from shore largely because of the Bell helicopter.

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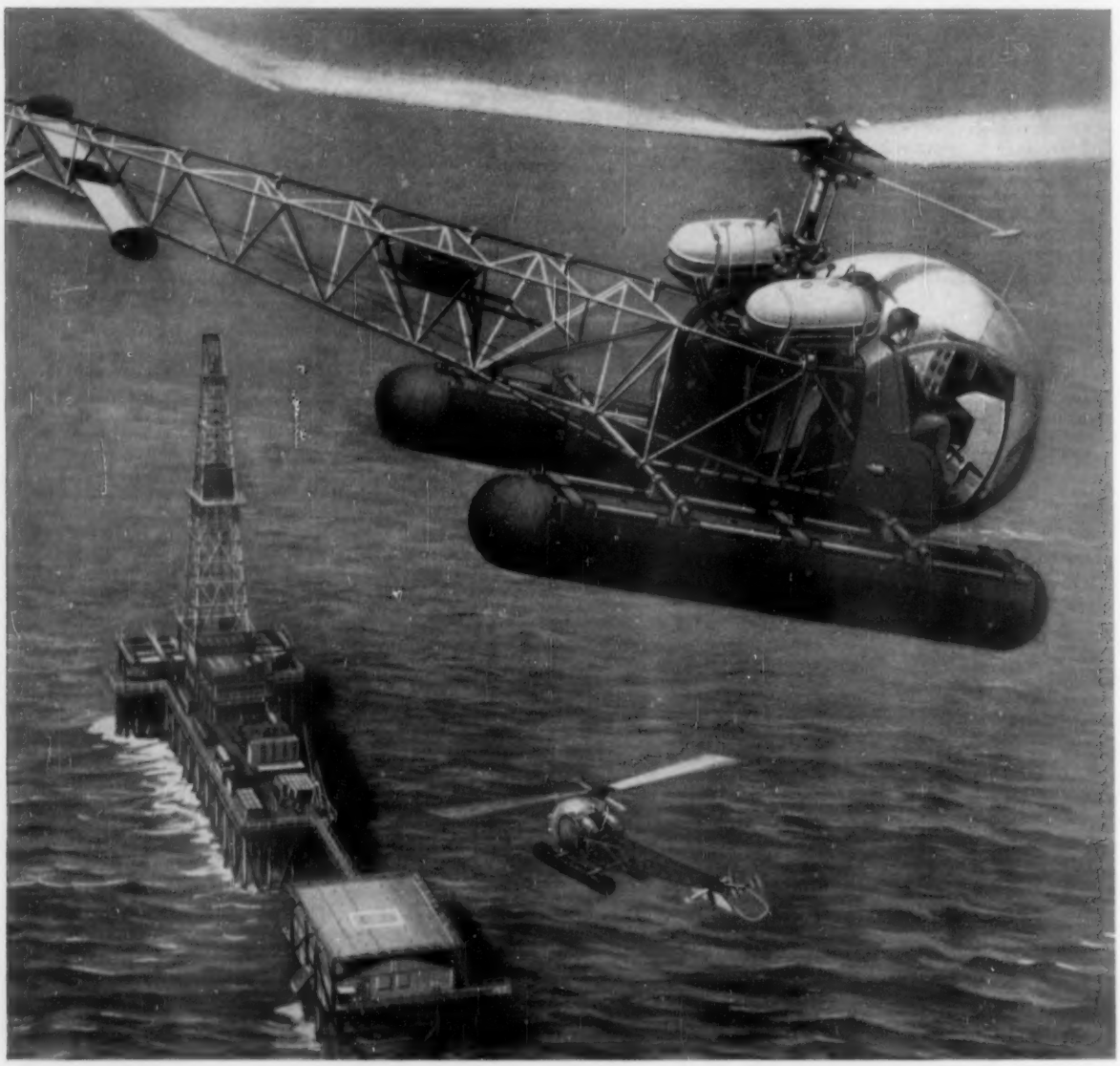

Among the

Drilling Contractors

Drilling Contractors Set Up 11-Point Program To Put and Maintain Industry on Sound Basis

THE American Association of Oilwell Drilling Contractors is setting up an 11-point program for drilling contractors to follow if their industry is to be placed and maintained on a sound basis.

The program reflects the current thinking of the contract industry, which is becoming increasingly aware of its large share of the responsibility as an important segment of the entire oil industry, Brad Mills, vice president of the association, pointed out.

Mills' belief is that many contractors feel their billion-dollar business is entering a new era. Economic pressures, resulting from the need to drill a greater number of wells faster and deeper than ever before, are resulting in greater efforts to improve drilling technology and attain financial stability, he said.

1. Bid realistically on all available work. Never take a job at an indicated loss for any reason. After all, under the free enterprise system we can exist only by making a profit.

2. Keep close contact with the oil company. You are in a way an employe of the producer.

3. Make every effort to keep up with competition. It is difficult to negotiate with a company when other contractors are outdrilling you.

4. Maintain your equipment well at all times. The company you drill for is always proud of a well-kept rig on its lease. Eventually this virtue will give you an advantage over the contractor who is less careful.

5. Never make an unnecessary show of prosperity or of poverty. Each is equally bad.

6. Realize at all times that the drilling segment of the industry is as important as any other. Never apologize for being a contractor.

7. Keep close touch with your rigs and your men. Know and counsel with all your key employes.

8. Familiarize yourself with every phase of contract drilling. Make sure you understand your insurance, cost accounting, labor, safety and technical field procedures. It is difficult to steer a ship without a compass.

9. Make your drilling department pay its own way. Don't depend on any other phase of your operations to absorb drilling losses.

10. Keep your own organization out in front. Always have available descriptive literature on your rigs, and make sure your equipment is suitable for doing the job at hand.

11. Don't expect some Moses to lead you out of the wilderness. The drilling industry is in your hands; be a leader yourself.

Midland Drilling Merger Involves Brantly-Lomax

Brantly Drilling Co. and Pete Lomax Drilling Co., two active Midland, Tex. contract-drilling companies, have joined forces and organized a new company under the name of Brantly Drilling Co., Inc., to carry on their merged interests.

M. M. Brantly, president of the former Brantly Drilling Co., will head the new organization, with Murphy H. Baxter, partner in the former Pete Lomax Drilling Co., as secretary-treasurer. Pete Lomax, president of the latter company, will be associated with the new organization but expects to devote much of his time to independent oil operations.

W. W. Berry, drilling superintendent of the former Brantly company, will continue with the new company in the same position.

The merger gives the new company eight rotary rigs, all currently operating in West Texas and southeastern New Mexico.

Gracey-Helms Drilling Co., Houston, has the contract on a 15,000-ft. test Union Oil Co. of California will dril in the Four League area, in the coasta marshes of Terrebonne Parish, Louisiana. Location is on a state lease in Four League Bay, eastern arm of Atchafalaya Bay.

Larco Drilling Co., Jackson, Miss., has taken on a well-deepening job for Seaboard Oil Co. It is at the latter's 1 Chancellor, a wildcat on the Brooklyn prospect, in southeastern Forrest County, Mississippi. Plans call for deepening the hole from 10,020 ft., where it originally was dry and abandoned, to about 12,500 ft. for a look at Lower Cretaceous sands.

Woolf & Magee, Tyler, Tex., has a new wildcat operation 2 miles west of Fayette, Jefferson County, Mississippi. It is a contract job for Clay Oil & Gas Corp., which has planned a 5,900-ft. Wilcox test. Location is slightly more than ½ mile northwest of the aban-

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doned discovery well of South Fayette field. The test is carried as 1 Stewart, with spot in 51-9n-1e.

Green & Heiser Drilling Co., Bakersfield, Calif., is drilling for Reserve Oil & Gas Co. at a wildcat location 2½ miles northeast of Tejon field, about 25 miles southeast of Bakersfield, in south-central Kern County, California. Contract is for 8,250 ft. The test is at 77-14 J.J.L., in 14-11-19.

W. C. Fatjo Drilling Co., Lafayette, La., is scheduled for a 9,000-ft. test a mile east of Shoats Creek field, in southern Beauregard Parish, southwestern Louisiana. It is a contract job for Sunray Mid-Continent Oil Co. Permit is for 2 Lutcher-Moore, in 2-7s-12w.

South States Drilling Co. has contracted for an 8,000-ft. Travis Peak test F. R. Jackson and J. Z. Werby, of Longview, Tex., will put down 5½ miles southeast of Mount Pleasant, in Titus County, Northeast Texas. Location is for 1 French, in the W. K. D. Spain Survey.

Rowan Drilling Co., Fort Worth, is contractor on a new Devonian test Texas Pacific Coal & Oil Co. is putting down in the recently discovered, and as yet, undesignated area 12 miles east and a little north of Lovington, in eastern Lea County, southeastern New Mexico. The test, 1-Q State, in 35-15-37, is projected to 13,300 ft.

KC & A Drilling Co., Abilene and San Angelo, Tex., is contractor on a new Ellenburger wildcat test Murray Petroleum Co., of San Angelo, is starting in Irion County, West Texas. Location is for 1 Sugg, in 45-10-SPRR Survey, about 2 miles southeast of Arden, and about 10½ miles north of Mertzon. Plans call for an 8,000-ft. test.

Circle Drilling Co., Lake Charles, La., has contracted for a 9,500-ft. test to be drilled for John F. Bricker & Co. at a wildcat location in southwestern Beauregard Parish, southwestern Louisiana. Location at 1 Quatre Parish, in 35-9s-13w, is 2 miles from production in the Starks area, on the Beauregard-Calcasieu parish line. It is 4 miles from the Texas line (Sabine River).

Dorris Ballew, Inc., Natchez, Miss., is getting under way on a deep Lower Cretaceous test it has contracted to drill for Phillips Petroleum Co. about 2½ miles south of Baxterville field, in northern Pearl River County, Mississippi. The test, 1 Paper, in 5-1s-16w, is projected to 12,000 ft., but provision is being made to deepen it, possibly to 16,000 ft., if conditions warrant.

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Here's a Simplex to save time and manpower on scores of oil field jobs. Ideal for close quarter operation; for safe jacking of mobile equipment and skidding rigs. Tilts on base for angular jacking. Lifts full 15 tons capacity at any of four points listed above. Send for Bulletin.

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The OIL AND GAS JOURNAL

Showcase

OF NEW EQUIPMENT AND LITERATURE

by Dan B. Miller

Cargo Crane Is Designed For Offshore Platforms

The Unit Mariner Model 360 is designed to meet all requirements for cargo handling from a stationary mounting on an offshore platform. It deviates from conventional revolving crane design by emphasizing strength in such components as turntable, turntable rollers, hook shoes, A-frame, boom, and boom hoist mechanism.

Features incorporated include double disk clutches, automatic safety brake, large foot-controlled swing brake with positive swing lock, and an external machine cut swing gear which is recessed into a roller path and comparable in size to that used on a two-yard crane-excavator. Six self-aligning load rollers mounted in pairs, two in front and one at the rear, rotate on the upper surface of this roller path. Self-aligning hook shoes which absorb the upward-thrust contact the lower surface of the roller path and are located at each end of the turntable. These hook shoes distribute the pressure over a maximum bearing area.

The hook shoes together with the self-aligning center-post trunnion which oscillates with the slightest tilt of the upper structure, relieve the turntable bushing from all possible transverse stresses.

A 16-ft.-high A-frame permits capacity loads to be handled on an extended boom at long radius. Boom point and pendant sheaves are of ample size to insure long life of cable. All of these features are important for offshore oil platforms and tenders. **For more information write or call: Unit Crane & Shovel Corp., 6411 West Burnham Street, Milwaukee 14, Wis.**

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Shutoff Valve Operates In 3,000 Psi. Service

This new line of shutoff valves for the control of oil from 0 to 3,000 psi. and air from 0 to 2,000 psi. is available in port sizes of ¼, ⅜, ½, ¾, and 1-in. N.P.T. The valves are capable of withstanding velocities up to 60 ft. per second without modification.

For operating convenience, the valve has a hand wheel with a position indicator and opens and closes in a 90° turn. It may also be obtained with a conventional handle. Provisions for panel mounting are included as standard.

The valve incorporates a shear-seal principle which consists essentially of a pressure-balanced, self-aligning tubular sealing ring. The shear-seal is in constant contact with an optically flat porting disk or rotor containing the flow passage. This sealing principle has proven effective where critical leakage specifications must be maintained. The shear-seal valve is particularly suitable for throttling. It allows gradual opening or closing to any de-

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sired degree of flow, smoothly and without fighting the fluid pressure, because there are no spools or poppets to obstruct the flow. **For more information write or call: Barksdale Valves, 5125 Alcoa Avenue, Los Angeles 58, Calif.**

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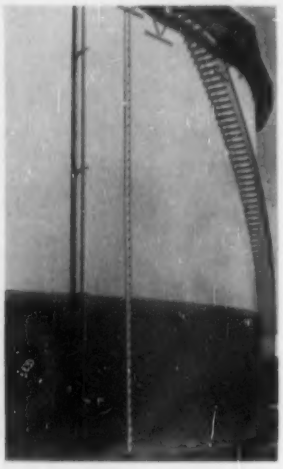


Decals Speedily Applied To Tanks or Gage Boards

A new method of tank-gage-board marking has been in use for 2 years at some refineries. A 56-ft. decal can be applied in less than 3 hours. It eliminates the laborious method of hand stenciling and can be applied directly to the tank or gage board.

These gages are accurate and uniform in all respects. The present gages have gone through complete weathering cycles and show no deterioration or fading. Better than twice the life of hand stenciling is anticipated. An additional factor is that these gages are reflective, thereby having the advantage of safety when tanks are gaged at night.

The gages can be made in varying lengths to fit the tank and are presently available in 6 and 10-in. widths. **For more information write or call: Decalcomania Products Co., 432 Plane Street, Newark 2, N. J.**

●

Mass Spectrometer Provides Multistream Analysis

This modified process-monitor mass spectrometer features added equipment that permits automatic multistream and

multicomponent analysis. The unit was developed to meet customer specifications for an instrument which would monitor gases from oil wells to permit closer control of the underground combustion of residual oil reserves. Similar added sampling systems can be designed to fit the exact requirements of many types of applications.

The modified unit consists of a standard Type 21-620 process-monitor mass spectrometer, an automatic programmer, a peak selector, and piping and valves. There are nine sample lines — eight for sampling the flowing streams and one for the standard sample, a static supply.

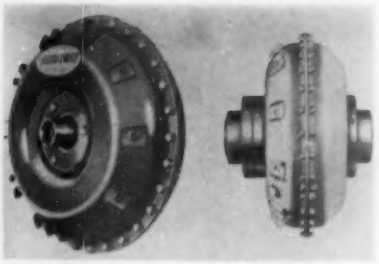
The programmer has a switch for each solenoid valve, so that any one or more of the sample streams can be cut out of the automatic cycle, or so that any stream can be switched to the mass spectrometer when on manual control. **For more information write or call: Consolidated Electrodynamics Corp., 300 North Sierra Madre Villa, Pasadena, Calif.**

●

Gyrol Fluid Drive Made For Engine or Motor Use

Designated size 126 Type T, this improved traction-type gyrol fluid drive is designed for industrial use with internal combustion engines as a fluid-power transmission.

Power rating in these applications is 25 to 85 hp., depending upon drive speed. When modified by installation of a flexible coupling half on each end of the fluid drive, the unit is well suited to constant-speed, electric-motor applications for driving processing



equipment. As a motor-driven unit, the size 126 drive is rated 7½ to 15 hp. for 1,200 r.p.m. and at 25 to 50 hp. for 1,800 r.p.m.

The new fluid drive is of die-formed, resistance-welded construction. The runner and impeller assemblies ride on two ball bearings which take the internal thrust of the unit, making the entire fluid drive a rigid assembly. Both bearings are readily accessible for inspection and maintenance.

Dimensions for the basic unit are 7⅛ in. over the shaft and 14 15/16 in. outside diameter. Over-all length for the electric-motor arrangement is 10 13/16 in.

The size 126 provides shock isolating smooth starting and torque-limiting characteristics for a variety of industrial-drive applications. Installation is simple for both internal combustion-engine and electric-motor mounting arrangements. **For more information write or call: American Blower Corp., Detroit 32, Mich.**

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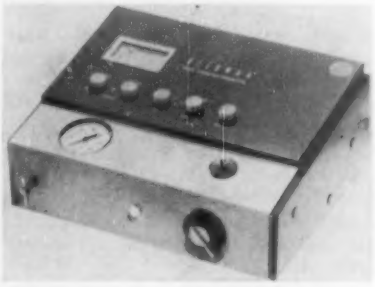

Compact Chromatograph Is Small and Accurate

The gas chromatograph is small, compact, low-priced, and designed especially for the analysis of gases and low-boiling liquids. Despite its small size, it is a precision unit, giving accuracies equaling even the highest-priced gas chromatography instruments for materials boiling to 80° C. or below.

The chromatographic columns are copper tubing with standard fittings and are easily removed. Columns of any length can be used in either ad-

sorption or partition type. Samples are admitted through a standard serum cap or by a unique sampling valve available as an accessory. A stream of helium carrier gas passing through the column sweeps the sample components out at different times depending upon their affinity for the absorbing material in the column.

The volume of each component gas coming from the column is measured by a diffusion-type thermal-conductivity cell which combines fast response with excellent stability. A one-millivolt potentiometer recorder with one-second response can be connected to the gas chromatograph for permanent recordings of sample volume. **For more information write or call: Scientific Instruments Division, Beckman Instruments, Inc., Fullerton, Calif.**

•

Kar Snoozer Permits Comfortable Sleep in Car

This Kar Snoozer permits comfortable sleeping in an automobile. The sleeping unit lies on the top of the back rests of the front and back seats and is held in place by a seat-cradle. Most cars will accommodate two Kar Snoozers. The unit measures 25 by 72 in. when assembled and will knock down to store in a 6 by 6 by 35-in. box. The frame is hardwood and 10-oz. white canvas duck forms the bed itself.

The Kar Snoozer can be used in the trunk of a car, outside the car as a cot, or as an emergency stretcher. **For more information write or call: Lafferty Supply, 4216 Cole, Dallas, Tex.**

•

Geology Trailer Provides Working, Living Area

Here is a special geology trailer for field use. Manufactured for a West Texas oil company, it is equipped with specially designed laboratory desk and filing systems so that analysis in the field can be made quickly and efficiently. The new unit provides ample working area for a crew of two men. The unit is also equipped with bunk beds and toilet facilities.

Standard models of mobile units are also available for oil-field service. Some units feature two bedrooms with standard double-bed equipment or, if preferred, they have bunk beds for one or both bedrooms. The units range in size from 28 to 46 ft. **For more information write or call: Melody Home Manufacturing Co., Fort Worth, Tex.**

Oil and Gas Journal Showcase

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Filter Removes Solids and Reduces Acidity

A new filter cartridge is made of Hilite, a processed, high-grade fullers earth that is water resistant. The Hilite-fullers earth is machine packed into an assembled container including a metal center tube properly covered to prevent possibility of migration.

It is designed for filtering straight-run mineral oils for removal of all solid matter and reduction of acidity. Due to the ability of the Hilite to absorb moisture, oils are kept dry. It is an ideal material for obtaining color restoration in most oils. This new filter cartridge is available in various sizes for use in Hilco fillers presently installed in the field, and also in new units manufactured by the company for using these filter elements. **For more information write or call: The Hilliard Corp., 98 West Fourth Street, Elmira, N. Y.**

•

Recording Thermometers Fitted for Many Uses

These portable recording thermometers are built to give accurate and dependable performance during years of

Oil and Gas Journal **Showcase Coupon**

USE THIS FORM TO OBTAIN INFORMATION ON ITEM DESCRIBED HERE

MANUFACTURER _____

ADDRESS _____

CITY _____ STATE _____

Please send me complete information on the following item

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Described in the Aug. 6, 1956, issue of The Oil and Gas Journal

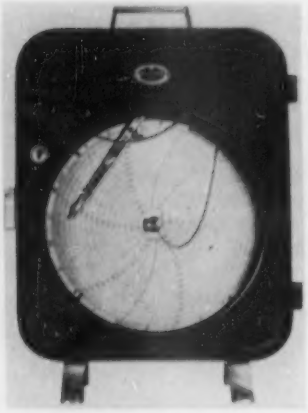
NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

DATE _____



service. They are designed for recording and maintaining accurate temperature test records where ready reference for future use is required.

Mercury or vapor-actuated, this instrument is supplied with either 8, 10, or 12-in. chart and is equipped with carrying handle and stand legs for easy carriage. Brackets for coiling connection tubing at rear of case and a locking device for holding bulb in place when instrument is not in use are standard fixtures.

The rust, dust, fume, and moisture-proof case is available in cast aluminum with self-contained bulb for air temperatures or with 5 ft. of interlocked spiral armor, and plain, union, or separable socket-connection bulb for use in air, steam, or liquids. Hand wound or electric motor chart drive with 4-hour to 31-day revolution can be furnished. An all-stainless-steel movement with double micrometer adjustment and stainless steel actuating spring are special features. **For more information write or call: Weksler Thermometer Corp., Freeport, L. I., N. Y.**

●

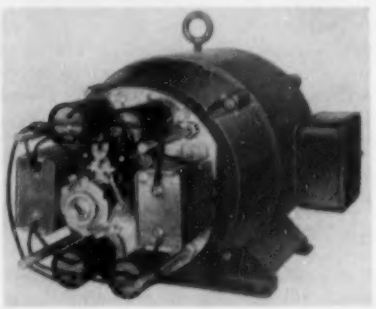
Three New Motors Designed For Oil-Country Work

Three new motors, two rated at 10 hp. and one at 15 hp., are completely protected against the weather, debris, and small field animals.

The new high torque, capacitor-start capacitor-run motors are available in 1,725 and 1,140 r.p.m. speeds. They are especially suited for use in the oil country and in applications requiring more than 7½ hp. on single-phase operation. Screens in the endhead openings seal the motors against entry of large objects of every kind.

External mounting of condensers and centrifugal switch mechanism in weatherproof covers yields quick and easy inspection even while the motor is operating. Ball bearings, prelubricated to operate for years without relubricating, are sealed against grain dust and other foreign matter.

All steel parts are protected by a moisture and rust-resistant under-coating. The cast-iron terminal box is gasketed and power leadins are sealed in



the motor shell. Clean sweep, high-velocity ventilation from end to end keeps motors internally clean and cool-running. **For more information write or call: Robbins & Myers, Inc., Springfield, Ohio.**

●

Gas Analyzer Operates Up to 225° C.

This new Model 154-B vapor Fractometer (gas chromatography device) permits fast analysis of gas and liquids boiling up to 300° C. at operating temperatures up to 225° C. A precision liquid-sampling system has also been developed as an accessory for the instrument.

The instrument's high-operating temperatures permit the analysis of such compounds as esters, cresols, phenols, xylols, chlorinated aromatics, and the higher alcohols.

The new instrument also incorporates a sample fraction-collecting three-way solenoid valve operated by a switch on the control panel so that individual fractions can be collected and separated as they emerge from the instrument, if desired. The collecting system enables reuse, separation and additional component analysis (by spectroscopic and other methods) of the sample. **For more information write or call: The Perkin-Elmer Corp., Norwalk, Conn.**

●

Mud Gun Swivels Freely and Can Be Hand-Set, Released

This new PB heavy-duty Mudjet mud gun combines free swiveling with positive setting. It swivels freely on both the horizontal and vertical planes. Free swiveling is provided by high-strength balls rolling in heat-treated alloy-steel races.

Called the Cam-Lok, a new locking mechanism sets the gun in any swivel. It is set and released by hand. One Cam-Lok controls vertical rotation, and the other controls lateral setting. The Mudjet gun may be left unattended or may be adjusted while in operation. **For more information write or call: Byron Jackson Tools, Inc., P. O. Box 2017A, Terminal Annex, Los Angeles 54, Calif.**

●

Insulation Blanket Resists Temperatures to 2,300° F.

Providing a high-temperature insulation blanket and made of Fiberfrax ceramic fiber, this material resists temperatures as high as 2,300° F. The extremely fine, closely intertwining aluminium-silicate fibers cause the blanket to keep its form and properties despite such high temperatures.

Insulating values for the Fiberfrax blanket at 600° F. mean temperature is 0.50 and at 2,000° F. mean temperature, it is 2.10, both at a density of 5 lb. per cu. ft.

The Fiberfrax blanket may be used on: (1) high-pressure steam lines, (2) diesel exhausts, (3) gas turbines, and (4) furnace ducts. Possessing high chemical stability, the blanket may also be used as insulation lining in alloy and refractory furnaces without harm from the furnace atmosphere.

Made without organic binders, the blanket is available in 25-ft. rolls 12 in. wide and ½ in. thick. **For more information write or call: The Carborundum Co., Niagara Falls, N. Y.**

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VALVE ROD LOCK NUT PREVENTS BREAKAGE OF VALVE ROD AND ELIMINATES UNSCREWING!

Lower lock nut also prevents valve rod breakage and allows a means of removing pump with the rod string.

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For more than half a century, D+B Pumps have met and satisfied the most exacting requirements of oil operators everywhere.

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Precision manufacture by expert workmen using the best materials insures better fit and superior performance.

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Expert service when you need it is available on a 24-hour basis from Continental Supply and D+B Pump Shops and field men in production areas. For information and bulletins, call your nearest Continental or D+B store.

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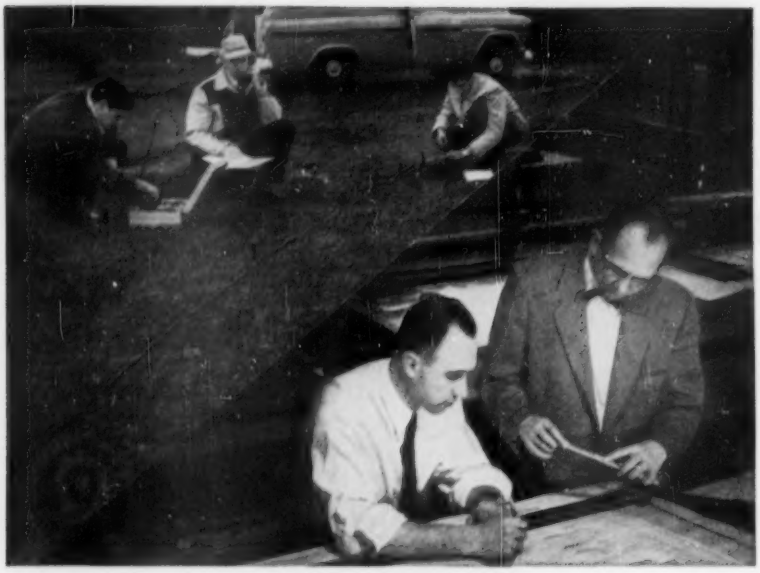

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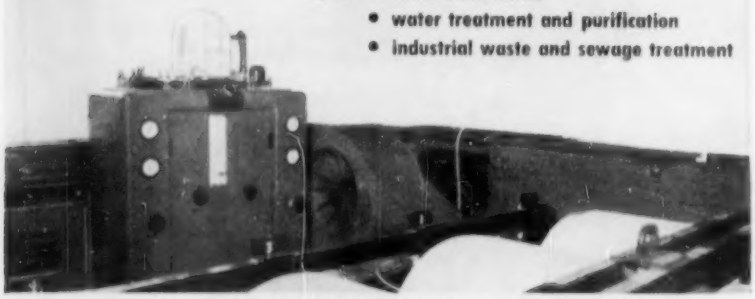

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OIL AND GAS JOURNAL Showcase

- BULLETINS
- CATALOGS
- BROCHURES

This Is Alberta, Canada. This 104-page booklet contains many photographs describing the Canadian province of Alberta. Material covering the oil industry presents pictures of equipment in the different segments such as drilling, producing, refining, pipelining, and petrochemicals. The front and back covers are illustrated with four-color photographs and maps. **For more information write or call: Director of Industrial Development Branch, Government of the Province of Alberta, Legislative Building, Edmonton, Alta.**

•

The Story of The National Supply Co. is told in this 34-page booklet. The booklet presents the beginnings and growth of the company up to the present time. Interesting facts about the growth of the oil industry are also pointed out. This two-color booklet contains many historical photographs and many pictures of the company's modern products, factories, and stores. The booklet covers present-day equipment problems in the oil industry, both here and abroad, and how they are met. **For more information write or call: The National Supply Co., 2 Gateway Center, Pittsburgh, Pa.**

•

Jet-Type Self-Cleaning Fluid Strainers are described in this 3-color, 16-page Bulletin PL-540. The bulletin explains that the strainers are designed to be cleaned in a matter of minutes by opening and closing valves and without removing the strainer element or basket from the unit. The bulletin contains many photographs, procedure drawings, and annotated cutaway drawings. The publication also describes and illustrates scraper trap closures and shows their dimensional data, couplings, and manifold fittings. **For more information write or call: Thornhill Craver Co., P. O. Box 1184, Houston, Tex.**

•

Dynamic Power Boost for Diesels, a 12-page booklet, explains how turbochargers increase diesel power and relates the development of models for smaller diesels such as those used on

pumping stations, stationary power plants, tractors, trucks, and on marine engines. This two color booklet presents engineering drawings on two models of turbochargers as well as performance charts, schematic drawings, applicabilities, and performance characteristics. **For more information write or call: AiResearch Industrial Division, The Garrett Corp., Los Angeles 45, Calif.**

•

Drilling Tools for Rotation Drilling Machines are illustrated by many photographs in this eight-page brochure. The bulletin presents a table of drilling and casing diameters showing German and Swedish dimensions. Cutaway pictures detail the core barrels and assemblies. The brochure contains pictures of drill pipe, casing, subs, and casing shoes offered by this German firm. It also pictures other drilling tools including bits, core barrels, fishing tools, and accessories. **For more information write or call: Alfred Wirth & Co., Erkelenz (Rhld.) Germany.**

•

Rig-Up for Export. An eight-page folder illustrates with photographs the steps in assembly for export of one of the biggest rigs. The folder presents the system for rig-up and transport used for the mud system, pump, draw works, and control units. **For more information write or call: Joe Stine, Inc., P. O. Box 14471, Houston 21, Tex.**

•

The Only Solution. The title of this multicolor booklet refers to method of dual completion gas lift that permits the separate running of two strings of 2-in. tubing in 7-in. casing or 1½-in. tubing in 5½-in. casing, with all valves for both strings selectively retrievable through a full-open tubing bore. All equipment is fully described with data tables, cut-away pictures, and engineer drawings. **For more information write or call: Camco, Inc., 7010 Ardmore, Houston, Tex.**

•

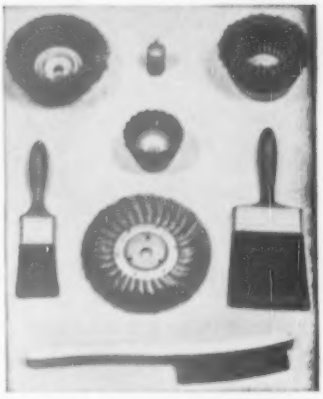
Fisher/Tag Saybolt Viscosimeter describes the newest model of the petroleum industry's oldest and simplest instrument for determining viscosity, the Saybolt viscosimeter. The instrument features better temperature control than ever before; safety at high temperatures; four-tube capacity; and an illuminated background for reading the receiver cups. Four-page Bulletin FS-261 recommends the instrument for chemists interested in refining; determining power needed for pumping and pipeline equipment; finding suitability

Faster metal cleaning

HIGH speed Osborn power brushes quickly and thoroughly remove even the heaviest deposits of rust, scale, dirt and incrustations from metal surfaces. They simplify the preparation of pipe ends for welding . . . speed up the finishing of welded joints.

These are but a few of the many metal cleaning problems that the oil and gas industry is solving with Osborn power brushing methods.

For information on Osborn's complete line of top-quality industrial brushes, write for Catalog 210-B. *The Osborn Manufacturing Company, Dept. N-11, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



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Osborn has a brush to meet every industrial need—power, paint or maintenance . . . and you get quality automatically when you specify "Osborn".

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Connect all your piping with Weco Unions and you will see what a difference the "right" union makes in superior sealing and service.

Only Weco has the precision-machined ball and cone seat that gives positive leak-proof protection, saving time and trouble on job after job. Only Weco has micro-machined Acme threads that make-up and break-out repeatedly without damage or distortion. Weco Unions are built to take the roughest service — and still maintain a perfect seal.

It will pay you to standardize with Weco — there's a "right" union for every job. They are available at supply stores everywhere.

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of an oil as lubricant or insulator in electrical equipment; and routine identifications, classifications, purchasing of fuel oils. **For more information write or call: Fisher Scientific Co. 381 Forbes Street, Pittsburgh 19, Pa.**

●

J-M Asbestocite is an illustrated, six-page folder. It explains how this asbestos-cement sheet material can serve industry and shows typical applications. These include the use of Asbestocite for cooling tower housings; for a weather protection on insulated outdoor tanks; and for the construction of fume hoods and ducts. The folder gives complete information on physical properties, sizes, thicknesses and dimensional tolerances. Also, it has a section on cutting, working and applying. **For more information write or call: Johns-Manville, 22 East Fortieth Street, New York, N. Y.**

●

Series 13,800 Twin Disc Three-Stage Torque Converter. The new 13,800 Series converter expands the Twin Disc line to include every horsepower range from 40 to 1,000. Features of the new converter include simplicity of design, one standard output shaft assembly, and three input arrangements. Illustrations and charts in Bulletin 507 explain the construction and application of the new 13,800 Series converter. **For more information write or call: Twin Disc Clutch Co., Hydraulic Division, Rockford, Ill.**

●

Well Water Systems—Pumps—Drilling—Allied Services. Bulletin 100 covers water-well systems, oil and water lubricated vertical turbine pumps, special water-well drilling, service work, shutter screens, wells and pumps, water and well treatment for rehabilitating water sources and other phases of water development for industry. **For more information write or call: Layne & Bowler, Inc., Memphis, Tenn.**

●

Displacement Slide Chart is designed to provide a convenient reference for displacement data for 2 and 2½-in. Kobe free pumps. The chart shows displacement, in barrels per day, for each stroke rate between 20 and 83 s.p.m. for engine and pump ends of all 2 and 2½-in. free pumps. On the reverse side, the chart has an exceptionally simple set of scales for determining the volumetric efficiency of both engine end and pump end of the free pump. **For more information write or call: Kobe, Inc., 3040 East Slauson Avenue, Huntington Park, Calif.**

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Southwest erects complete gas compressor plants: engineering, compressors, barge, building, on one purchase order and with single responsibility from beginning to end. The floating unit shown above was designed, pre-assembled and tested in the Southwest shops, then barge mounted, and delivered complete in 135 days. Southwest does the complete job in building compressor stations afloat, on platforms, or on land giving you faster delivery, lower *installed* cost and undivided responsibility.

The unattended operation, possible with the automatic controls and safety devices on Southwest Packaged Compressor Plants, cuts operating cost per horsepower-hour to a fraction of the cost of a fully attended stationary installation. A Southwest engineer can show you actual comparative operating costs.

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EQUIPMENT MEN . . . in the News

Eastman Sets Up Chemical Sales Development Section

W. M. GEARHART

Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Co., has created a new chemical sales-development section separate from its commercial sales department, according to Dr. J. E. Magoffin, sales manager for its chemical division.

William M. Gearhart, formerly chief chemist in charge of the service and development laboratories at Kingsport, Tenn., has been appointed manager of the new section. R. B. Herring who had served as assistant to Gearhart, has been promoted to chief chemist in charge of the laboratories, which will continue under Gearhart's supervision.

All work with products being considered for the first time, and those in the development stage, will be assigned to the new chemical sales development group. Gearhart and his staff will coordinate all laboratory work and industry contacts in bringing new developments to commercial status.

Appointments in Canadian Area Made by Oilwell

Appointment of Walter S. Palmar as assistant to the district manager at Edmonton, Alta., for U. S. Steel's Oil Well Supply Division has been announced by W. A. Weir, Canadian area manager. Named to succeed Palmar as store manager at Edmonton was Robert V. Stewart. John H. Hudson succeeds Stewart as store manager at Swift Current.

Thomas M. Harvey has been named area engineer. Luther T. Tidwell, whom Harvey succeeds, has been named area manager, machinery sales, with headquarters remaining at Calgary. Jake B. Burton has been named area manager, production equipment sales, at Edmonton. Transfer of Edward Norman Spice from Red Deer to Edmonton was also announced by Weir.

Palmar was named manager of the Okotoks store in 1950 and in 1953 he transferred to Edmonton as store manager. Stewart, who joined the division in 1948, served as field representative at Edmonton and as store manager at Swift Current. Hudson was employed by Oilwell in 1952, transferring to Calgary in 1954.

Harvey became assistant district engineer at Edmonton in 1952, holding that post until his transfer to Calgary in 1954. Tidwell, who joined Oilwell in 1947 was appointed area engineer at Calgary in 1952.

Burton became manager of production equipment sales in Dallas in 1954. Spice was appointed assistant to district engineer at Wetaskiwin in 1954 and in 1955 was transferred to Red Deer in that capacity.

Davison Adds Thompson to Catalyst Sales Department

John B. Thompson has been named field service engineer at the Baltimore home office of Davison Chemical Co., a division of W. R. Grace & Co. He succeeds Albert J. Gnesin, who has opened a new office for Davison at San Francisco.

Thompson was formerly in charge of the petroleum chemicals section of Eastman Chemical Products, Inc., and chief chemist of Bay Petroleum Corp.

Cabell and Orton Named Vice Presidents of Mathey

The appointment of William W. Cabell as vice president and general sales manager for C. A. Mathey Ma-

W. W. CABELL

L. V. ORTON

chine Works, Inc., Tulsa, has been announced by O. F. Dickenson, president. The promotion of L. V. Orton to vice president in charge of development and production was also announced.

Cabell was formerly treasurer of Mathey and has been with the firm since the new managership was taken over by O. F. Dickenson. Before employment with Mathey, Cabell was with Buda Engine Sales & Service.

Orton was formerly plant superintendent and has been with C. A. Mathey 30 years. He is experienced in the specialty equipment business in both field problems and plant production.

National's Aspermont, Tex. Store Managed by Overbey

The National Supply Co. has opened an oil-field-supply store at Aspermont, Tex., and has named T. W. Overbey, Jr. as manager of the store. It is under the supervision of John R. Walker, district manager of the Abilene district.

The new store, which also includes a pump shop, will serve drilling contractors and producers in Dickens, Haskell, Kent, King, Knox, and Stonewall counties, and parts of Fisher, Jones, and Throckmorton counties. Formerly these areas were served by the company's stores at Abilene, Snyder, or Wichita Falls.

Chapman Heads Johnston's Expanded Industrial Sales

P. S. CHAPMAN

Paul S. Chapman, former district manager of the San Francisco office of Johnston Pump Co., has been elevated to manager of industrial sales, according to C. J. Schleeweis, sales manager. The company is increasing its emphasis on the application of industrial pumps in order to improve service and to gain product standardization.

Chapman has a wide background of pump experience. He has been employed by Johnston since 1951.

Christensen Makes Films Available to Oil Industry

Three industrial films are now available at no cost from Christensen Diamond Products Co., Salt Lake City, Utah. These films are all 16 mm. color with sound, and average 25 minutes in length. Any one film, all three, or a combination of any two films may be obtained.

Film 1 deals with diamond production in South Africa and shows how diamonds are recovered from the Kimberly mine and from alluvial deposits. Film 2 shows, by a brief tour of Christensen's Salt Lake City plant, how diamond bits and barrels are manufactured. Film 3 shows the application of diamond products to use in the petroleum, mining, and construction industries.

McCullough Tool Makes Personnel Changes

W. H. Harvey has been appointed district sales manager for McCullough Tool Co.'s Fort Worth area. Harvey

W. H. HARVEY

K. K. CAMPBELL

replaces John Watson who recently was promoted to assistant eastern division sales manager for the Mid-Continent area.

K. K. Campbell has been named West Texas district sales manager with headquarters in Midland; W. S. (Bill) Gesell, senior sales engineer has been transferred from Odessa to the McCullough Midland sales office; R. F. Tulis and R. G. Wisenhunt have been promoted to sales engineers at Odessa; T. O. Brown has transferred from Tyler to Odessa as sales engineer. Bob Cremer has been appointed city sales engineer for Tulsa. Gene Polk has been named sales engineer at Cody, Wyo. These appointments have been announced by I. J. McCullough, president.

McCullough also noted that McCullough Tool has opened a new service branch at Pampa, Tex. The branch provides radiation well logging, bullet and jet perforating, and all types of wire-line services. Jack Hankla, with McCullough for 8 years, is manager of the new Pampa branch. Clarence O. Wilson has been placed in charge of sales for the new branch. Field operations at the new branch are under the supervision of G. A. Shidell, Oklahoma district manager with headquarters in Oklahoma City.

Houston Contracting Wins Holmes Safety Certificate

Houston Contracting Co., a leading firm in the field of pipeline and compressor-station construction, was recently awarded a certificate of honor by Joseph H. Holmes Safety Association.

The award was received for reduction in accident rates during the 1949-55 period. In the 5 years, Houston Contracting Co. reduced its rate of accident frequency approximately 65 per cent and severity approximately 94 per cent. The frequency figure represents the number of accidents per million man hours worked; the severity is the number of lost days per 1,000 man hours worked.

Continental Opens Sales Office, Lafayette, La.

Continental Supply Co. has established a sales office at Lafayette, La., located in the Voorhies & Labbe Building.

The office will be under the management of G. K. Ashmead, formerly of Continental's Houston division office. It will be under the supervision of E. A. Dunn, district manager at New Orleans.

L. B. Foster Expands Houston Operations

The appointment of Ray Laden as district sales manager and the transfer of L. B. Foster Co.'s southwestern headquarters to larger offices have been announced by R. A. Anderson, vice president and regional general manager in the Houston office of the company.

Laden has been with Foster 7 years. Foster's new Houston headquarters are in the Bank of the Southwest Building. The company also maintains a 17-acre Houston warehouse stocked with a complete line of the company's products.

Suardi to Head Graver's San Francisco Office

John M. Suardi has been selected by Graver Tank & Manufacturing Co., Inc., to head its San Francisco sales office. Prior to his new position, Suardi was Graver's field service engineer, with special attention to all types of conservation tankage. In the 10 years he has been with Graver, he has held positions of sales coordinator, production-control supervisor, and assistant manager for procuring steels and alloys.

Pritchard Appoints Hoke New York Sales Engineer

The appointment of Dayrel G. Hoke as sales engineer, New York district office of J. F. Pritchard & Co. of California, has been announced by Karl E. Johnson, vice president and general manager.

Prior to joining Pritchard, Hoke was a sales engineer for Kewanee Boiler Corp.

BJ Service Holds Sales and Operations Meeting

The management of BJ Service, Inc. recently held a combined sales and operations meeting at the Long Beach, Calif., general office. Featured at the meeting was the formulation of plans for continuing expansion of BJ Service into new areas as well as introduction of new services in areas already served by the company. Plans also were developed regarding new equipment the company is producing.

Participating in the meeting were: John B. Merritt, executive vice president; W. T. Box, vice president in charge of operations; M. B. Riordan, vice president in charge of engineering and development; O. N. Andrew, sales manager; C. F. McMahan, assistant sales manager; J. T. Streger, Pacific Coast division manager; C. R. Cross, Permian basin division manager; J. L. Buster, Rocky Mountain division manager; Jack Smith, export representative; and R. E. Wilkinson, executive assistant.

BJ Service, Inc. personnel are shown at the company's sales and operations meeting. Front row: R. E. Wilkinson, John B. Merritt, J. T. Streger, and C. R. Cross.

Back row: Jack Smith, O. N. Andrew, C. F. McMahan, W. T. Box, M. B. Riordan, and J. L. Buster.

Use them BOTH *to reduce drilling and completion costs!*

DRISCOSE* **saves time, saves money!** DRISCOSE, a high-stability, high-purity CMC (99.9%), allows you to control water loss, viscosity and gel strength for optimum drilling conditions. At the same time, low pH, low solid DRISCOSE emulsions give you higher penetration rates. You save on operating time and on expensive bit replacements. DRISCOSE also helps avoid tight hole troubles. Consult our technical representative about your particular mud problems. Let him prove that DRISCOSE can save you money on your mud program.

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*Driscose is a trademark for 99.9% pure Sodium Carboxymethylcellulose.

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BARTLESVILLE, OKLAHOMA

Let's Not Sell Williston Short

by Frank J. Gardner

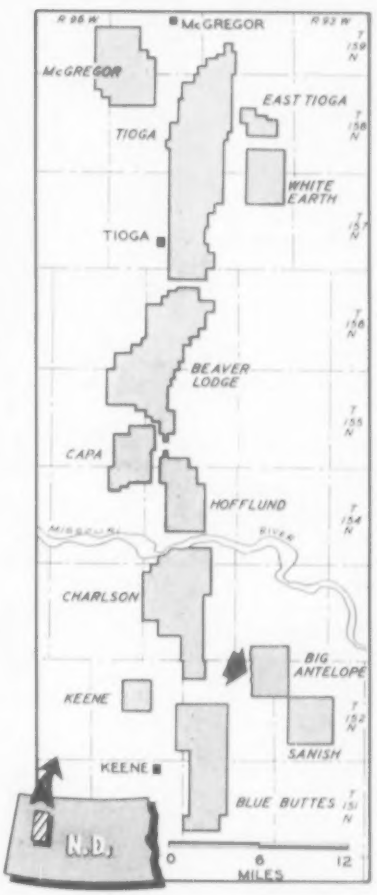
THE recent discovery of Big Antelope field in McKenzie County, North Dakota, is a cause for reflection by oil finders. For it is a fitting climax to North Dakota's 5-year oil history that this strike, 21 miles southeast of the original Iverson well, is one of the best wells yet found in the state.

The discovery well was Amerada Petroleum Corp. 1 Lacey-Norby (Section 1-152n-95w), completed in May of this year for 312 bbl. daily from Madison-Mississippian at 9,057-88 ft. The drilling block was tangent to Sanish field immediately southeast, and was a long step toward filling the barren gap between Sanish and Charlson fields. On June 28, Amerada completed its 1 Larson as the first confirmation; it was not as good a well as the 1 Lacey-Norby, potentialing 248 bbl. of oil and 80 bbl. of water per day, and ran structurally low to the discovery.

A record find . . . But the impressive thing about the first well was its pay section. Although it was completed from only 30 ft. of pay, the total section of porosity and saturation was about 300 ft., to make it the thickest apparent pay zone yet cut in North Dakota. At a hearing before the North Dakota Industrial Commission in June, evidence was produced to indicate a gross productive water-free section of 570 ft., but later tests have evidently reduced preliminary measurements.

Nevertheless, a discovery like this brings home one big fact—how **little** we know, even about a proved productive structure like the Nesson anticline. When the original Iverson well opened North Dakota's first field in the spring of 1951, Rocky Mountain operators had reached an all-time low in their attitude toward the Williston basin and its possibilities. Immediately after that important strike, the state went on a wild orgy of leasing and drilling. But after only 3 years, the "boom" was over. One disappointment after another scared away the independent and many a major.

And commendable success . . . A look at the map and an examination of the discovery record reveal a commendable success record in the state, and little evidence for alarm. Here, a 50-mile band of almost solid production has grown from that first discovery. The widest gap between any two of the fields on the Nesson anticline today is the 1½ miles between Charlson and Blue Buttes fields. The narrowest is the half-mile strip between Beaver Lodge, Capa, and Hofflund fields, and seven wells now drilling there may well link at least Beaver Lodge and Hofflund.



FIVE YEARS of wildcatting and development along North Dakota's Nesson anticline have yielded 50 miles of almost unbroken productive acreage in Burke, Williams, Mountrail, and McKenzie counties.

The gloom that envelops the Williston basin is without geologic basis or reason. Early disappointments were to be expected, but the plunge from the wild enthusiasm of 1951 to the pessimism of 1955-56 is unfounded. Eminent geologists say that "oil is found in the minds of men," and as long as the minds of men are squeezed in a vise of prejudice, they're not likely to find many new fields. Geological consultants in the basin complain that it's almost impossible to lure new wildcat money into the basin. But within the next 3 years, those who sewed up huge blocks of acreage in the blitz campaign of 1949-51 are going to have to decide between surrendering and exploring.

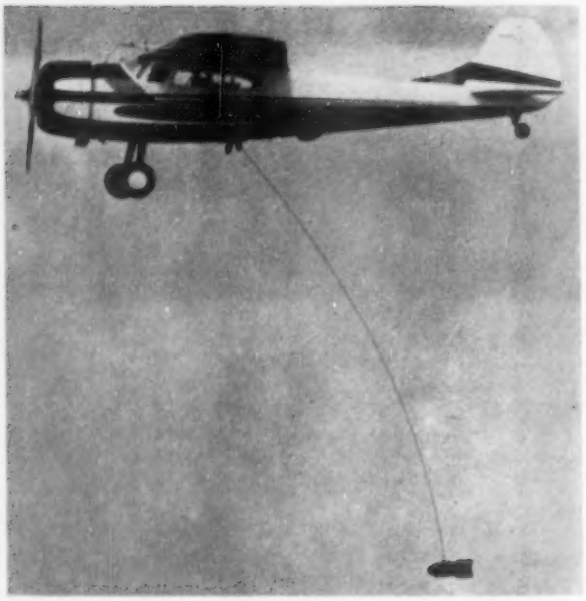
It all began in the late 1940's, following the discovery at Leduc, far to the north in Alberta. Geologists and land men were capable then of selling management on the idea that the Dakotas and Montana should pay off with similar prospects to those in the Alberta basin. Are they not capable today of selling that same management on systematic exploration?

The drilling that has been done since 1951 has revealed much new knowledge of the basin outline, its section, and its possibilities. In the first weeks after the original Beaver Lodge discovery, no two maps of the basin looked alike; today, as we look back at those early maps, some of them are quite entertaining and humorous, but they were the best available at the time. It was the biggest basin yet laid before the United States oil man for exploration, and he was a bit overwhelmed. He still has a lot of drilling to do before he can begin to tap its potential.

Should brighten the hope . . . The finding of a record thickness of pay 5 years after the initial discovery, and 21 miles away, plus the baker's dozen of North Dakota fields off the Nesson structure should brighten the hope that Williston has a lot to offer the wildcatter in the years ahead. Day-to-day discovery events between now and 1960, we predict, will continue to convince us of how very little we know. Are we less adventuresome, less intelligent, or less aggressive than our Canadian cousins to the north, who are on a discovery binge on the north flank of Williston?

Nuclear Magnetometer Reveals Structural Grain With Aerial Mapping

by K. E. Hunter and J. C. Whitaker



THE PRECESSION AIRBORNE magnetometer measures the absolute magnitude of the earth's magnetic field. It is particularly useful in reconnaissance work in oil exploration.

WITHIN the last 2 years, a new airborne magnetometer, based on an entirely different principle, has been developed and is being used in aeromagnetic mapping throughout the world. This nuclear precession magnetometer is based on the principle of nuclear resonance.

In new or virgin areas of exploration, the nuclear precession magnetometer offers the most inexpensive method of revealing the structural "grain" of the country. Thus, the regional trend, major folds, local changes in strike, and variations in depth to basement may be revealed by an airborne magnetic survey. When this information is combined with a complete photo-geologic evaluation study, the greatest amount of information has been obtained for each exploration dollar expended.

Unless obvious target areas are outlined by this preliminary approach, it is recommended that more precise magnetic and photo-geologic techniques should be employed before more expensive geologic field work and seismic surveys are performed.

Derivative magnetic maps have the effect of removing near-surface effects from the broad anomalies resulting from basement relief. The approximate position and shape of features on the basement relief are outlined. And the anomalies are classified according to their relative probability of indicating sedimentary structure. The final result is a structural contour map of the basement showing thickness of section, and the general configuration of the basement surface.

Authors are with Hycon Aerial Surveys, Inc., Pasadena, Calif.

This more detailed magnetic approach can be coupled with the use of more precise photo-geologic evaluation technique, employing precision stereo plotters and color photography. Measuring of accurate thickness of section and elevation readings on key beds is now an established practice. With such vital quantitative information, it is possible to accurately determine areas of structural closure. Thus, structure contour maps can now be turned out at costs well below those required to send geologic survey parties to the field.

New horizons . . . Color aerial photography has opened new horizons for photo-geology. Maps now show color facies—i.e., lithologic facies insofar as color is related to lithology. Thus, key stratigraphic information is obtained before the geologist sets foot on the ground.

Within known petroleum provinces where some surface and/or subsurface information exists, there are still geological conditions which lend themselves quite well to the adoption of airborne magnetic methods.

In the numerous graben-type valleys of the basin and range province, for example, major structures can be determined and definite estimates of thickness of section are quite feasible with aeromagnetic methods.

In areas where contorted evaporite beds are present, local and even regional folds are often disguised by the confusing surface geologic picture. Similarly, structural unconformities within the section are often caused by incompetent evaporite beds. This condition is usually not shown by the surface geology and often is not detected by seismic methods.

Where there are extensive low-angle overthrusts, it is often difficult, if not impossible, to get structural data on the footwall with other geophysical methods. Even where windows of the footwall are exposed in the thrust sheet, the proximity to the thrust sole usually causes deformation of the beds to such an extent that reliable structural information cannot be obtained.

Practical advantages . . . The nuclear precession magnetometer has the advantages that the reading is independent of the orientation of the detecting device with respect to the earth's field, since it is only necessary to tilt the protons away from the earth's field in order to get a precession. Further, since the determination of the earth's field is only based upon a knowledge of the gyromagnetic ratio which, being a property of the nucleus, is independent of any physical change in the environment; there are no errors caused by temperature, humidity, or pressure changes. Also, the detector is independent of shock.

A measurement of this type is inherently more accurate since it is a counting operation. Linearity of amplifiers is not necessary as they are in systems where amplitudes are meas-

ured. Since the magnetometer reads the absolute value of the earth's field, no buckout circuits are called for, with their disadvantages which lie in the fact that the current in the buckout coil must be kept constant, which is in fact a very difficult thing to arrange.

The magnetometer is extremely light in weight, the complete unit weighing only about 80 lb. This enables the magnetometer to be installed in light aircraft and in helicopters, with a consequent savings in operational costs.

It is standard practice at Hycon Aerial Surveys to use economical Cessna 55's. Performance of these aircraft equals or exceeds that of many multi-engined craft because of the light weight of the magnetometer and the addition of a 450-hp. engine in place of the usually installed 300-hp. engine. This gives the aircraft a ceiling of 24,000 ft. This arrangement has proved extremely useful in that aerial photography (either conventional black and white or color) can be flown by the same aircraft that completes the magnetic survey.

Flight pattern . . . When using a ground-station magnetometer for control, a conventional grid system of flight lines is no longer necessary. Since the readings from the nuclear precession magnetometer are absolute, they are easily correlated and it is not necessary to fly cross-profiles provided a ground-station magnetometer is used to correct the airborne results for diurnal variations. This results in a faster, more accurate, and more economical aeromagnetic survey.

The absolute readings enable accurate maps to be produced regardless of whether the profiles are flown parallel or normal to the general tectonic trends.

Theory and instrumentation . . . Within the last 2 years, a new airborne magnetometer, based on an entirely different principle, has been developed and is being used by Hycon Aerial Surveys, Inc., in magnetic mapping throughout the world. The free precession magnetometer uses the principle of nuclear magnetic resonance.

It has been found that nuclei possess both magnetic, and spin angular moments.* As a result the magnetic moment will tend to align itself with the earth's magnetic field. As the nuclear magnetic moment moves into alignment with the field it precesses in a manner exactly analogous to that of a gyroscope under the action of an external torque. The frequency of this precession is exactly proportional to the strength of the magnetic field according to the equation

*Bloch F., Hansen W. W., and Packard M., Physics Review 69, 127, (1946).

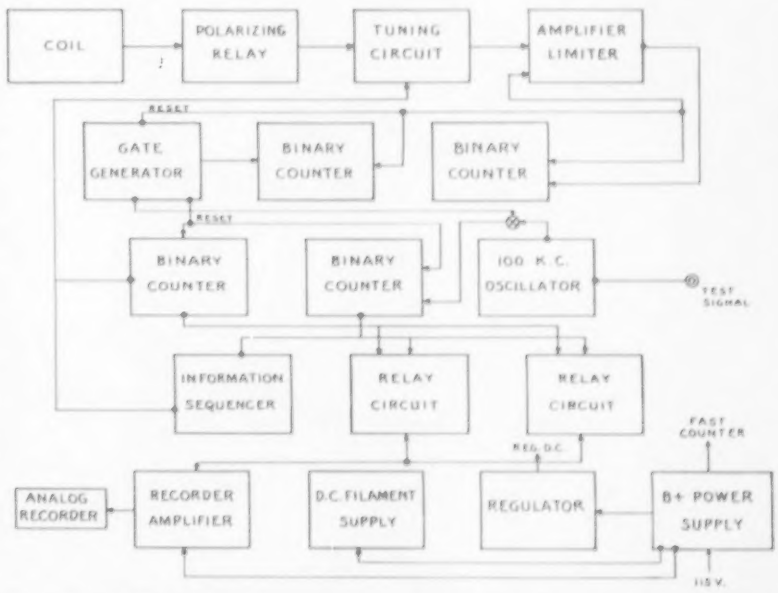
"The nuclear precession magnetometer has the advantages that the reading is independent of the orientation of the detecting device with respect to the earth's field, since it is only necessary to tilt the protons away from the earth's field in order to get a precession . . . A measurement of this type is inherently more accurate . . ."

$$H = 23.4868f$$

where H is the absolute magnitude of the earth's total magnetic field and f is the precession frequency. The numerical constant is the reciprocal of the gyromagetic ratio of the nucleus, which has been measured in the laboratory to an absolute accuracy of about 1 part in 40,000. The precession frequency depends only on the magnitude of the earth's field and the gyromagnetic constant and thus the measurement is inherently highly accurate.

The magnetometer uses for the detecting element the abundant protons in a water sample. A coil within the water sample serves both to polarize the sample and to detect the precessional frequency. Polarization is accomplished by passing a direct current through the coil which sets up a magnetic field of about 100 gauss in a direction along the axis of the coil. The protons then align themselves along the direction of this field. When the current is turned off the polarizing field collapses and the protons are acted upon only by the earth's field. The protons then move back into alignment with the earth's field precessing in phase at frequency proportional to the strength of the field. This causes a voltage of the same frequency to be induced in the coil which now becomes a detector. If now this frequency be measured the absolute value of the earth's field is completely determined.

Following the detector are tuning circuits which adjust themselves automatically to the range of frequencies which are being measured at the time. The signal is amplified and limited so that it becomes essentially a square wave when it is fed into the binary counter. The binaries with the gate generator establish a time interval corresponding to say 512 cycles of the precession signal. During this time the output from an ultrastable high-frequency oscillator is fed into a second bank of binary counters which thus accurately determines the length of the time interval. The frequency of the precession signal can thus be measured to a high accuracy. Using a 400-kc. oscillator and counting over 512 cycles of precession frequency, an absolute accuracy of measurement of ± 0.5 gammas is obtained at Los Angeles. If 1,024 cycles of precession signal are counted the accuracy becomes ± 0.25 gammas.



SCHEMATIC DIAGRAM of the precession magnetometer. Coil at extreme upper left serves both to polarize the water sample and to detect the precession frequency.

EXPLORATION HIGHLIGHTS

APPALACHIAN

OHIO

What will probably be a small Newburg sand gas pool was found in Section 7, Royalton Township, Cuyahoga County, by Ohio Fuel on 1 A. D. Ring. Sand was logged at 2,727-84 ft. with 150,000 cu. ft. natural and 450,000 cu. ft. after acidizing.

● Pennoco Oil & Gas extends an area of Flint Ridge field in Hopewell Township, Licking County, ⅓ mile to the east. On 1 Mary Vincent, Section 10, Clinton was found at 3,070-3,114 ft. and gaged 100 bbl. in a 24-hour test after fracture. In the east extension of the field, Coury and Bumgard 5 Elsie Carson, Section 15, Hopewell Township, Muskingum County, gaged 380 bbl. in 24 hours after fracturing Clinton 3,283-3,312 ft.

EASTERN KENTUCKY

In Floyd County, Kentucky, West Virginia Gas Co. is drilling at 3,940 ft. at its 6333 Philip Dingus wildcat. Current depth places it in the Trenton lime sequence of the Ordovician.

HUGOTON EMBAYMENT

NORTHWESTERN OKLAHOMA

Permian Gas Strike Reported in Woods

A rank wildcat in Woods County came up with the first Permian gas production in northwestrn Oklahoma, outside Hugoton field. The discovery well is Phillips Petroleum Co. 1 Avard, near the town of Avard, SE NW NW 9-26n-15w.

On drill-stem test of the Neva at 3,055-80 ft., open 1 hour, gas showed in 1½ minutes, reaching a volume of 1,700 M.c.f. in 15 minutes and 2,070 M.c.f. in 30 minutes. Recovery was 270 ft. of oil and gas-cut water.

OKLAHOMA PANHANDLE

Rank Cimarron Test Finds Shawnee Gas

The extreme southeastern corner of Cimarron County in the far northwest part of Oklahoma recorded a remote Pennsylvanian gas discovery. The strike

First Permian production in northwestern Oklahoma, outside the Oklahoma Panhandle area, was indicated at Phillips Petroleum Co.'s 1 Avard in Woods County.

is Phillips 1 Bruere, C SW NE 24-1n-9eCM, near the Sherman County, Texas, line.

After fracturing the wildcat flowed gas from both the Wabaunsee and Shawnee zones of Pennsylvanian age. Perforations were made at 3,228-89 and 3,312-90 ft. Flow reached 2,468 M.c.f. of gas per day, with some water. Location is northwest of Stratford-Cisco field, a Pennsylvanian gas area in Sherman County, Texas. This is first production for this portion of Cimarron County.

A rank Pennsylvanian gas discovery was gaged last week at Phillips Petroleum Co. 1 Bruere in the extreme southeast corner of Cimarron County, near the Sherman County, Texas line.

TEXAS PANHANDLE

Lips Ranch Well Hits in Mississippian

Stanolind No. 1 Lips ranch "A," Roberts County, Texas, was completed for 2,630,000 cu. ft. of gas daily from the Mississippian lime, topped at 8,838 ft. The well was drilled to 11,500 ft. in the Ellenburger and plugged back to 9,150. It is the second well completed on Lips Ranch acreage, but is classified as a wildcat since it located an entirely new pay. Stanolind holds full interest in 50,000 acres on the Lips Ranch. Location of the well is Section 158, Block 13, T&NO Survey, Roberts County, Texas.

ROCKY MOUNTAIN

NORTH DAKOTA

The long-awaited eastside Williston wildcat campaign has begun. Calvert Drilling Co., Inc., of Olney, Ill., has completed a farmout agreement with Mobil Producing Co. and Atlantic Refining Co. in North Dakota.

Under the agreement, Calvert will drill 16 wildcats along the eastern rim of the Williston basin in North Dakota. Tests will be located in Wells, Foster, Eddy, Logan, and McIntosh counties.

Twelve of the wells will test Mission Canyon, with the remaining four to be pre-Cambrian tests. The company has already drilled two dry holes in Eddy County.

The wells are in the eastern part of Williston basin in an area that has had little drilling this year. There have been no previous tests in the immediate vicinity.

The industry is watching the tests closely. A strike in this vast virgin wildcat country would open a whole new province for exploration.

Calvert's partners in the joint venture are Western Oil & Gas Co. of Minneapolis, International Refineries, Inc., of Minneapolis, and Leach Oil Corp. of Bismarck.

Western test . . . Calvert spudded the 1 George Spotted Wolf in the western part of the state. Location is in the

OTIS SAFETY VALVES

Otis—"First in Pressure Control"

Lucky Mound Creek area of McLean County. The well, on a Stanolind Oil & Gas Co. farmout of 1,520 acres, will be Mission Canyon test.

COLORADO

Dakota Gas Flows at Southeast Rangely

A significant Dakota gas discovery in Rio Blanco County's Southeast Rangely area, northwestern Colorado, flowed gas at the estimated rate of 10,000 M.c.f. per day.

The G. E. Kadane 1 Moran-Government, C SW NE 30-1n-101w, 4 miles southeast of Rangely field production (Mancos), was a 8,541-ft. deep test, plugged back for completion in the Dakota sand. A Weber-Pennsylvanian test at 8,100 ft. got only slightly oil and gas-cut mud.

The immediate area around the Kadane discovery has had no drilling. North Douglas Creek field, 4 miles south, is the closest production. That field, opened last spring by Phillips Petroleum Co., is a Weber oil and Mancos shale gas producer. New interest in the deep potentialities of the Weber sand throughout the Piceance Creek basin area is shaping up fast. The Dakota discovery at Southeast Rangely should also set off a drilling program for production from that sand. The Dakota had good gas shows in the early days of drilling at Rangely field.

Clark Fork Confirmation Flows Lakota Oil

The confirmation discovery to Northwest Clark field in Carbon County, Big Horn basin, flowed oil at the estimated rate of 10-20 bbl. per hour on a drill-stem test of the Lakota sand at 8,980-9,043 ft. The operator reports that the sand is hard and tight with little porosity or permeability. Coring continues below 9,043 ft.

British-American Oil Producing Co. opened Northwest Clark field last winter for 338 bbl. of oil and 1,681 M.c.f. of gas daily from 8,940-50 ft. in the Lakota.

GREAT LAKES

MICHIGAN

Grout Dundee Field Has Deep Pay Shows

On the basis of preliminary core analysis, a new Richfield oil pool appeared to be almost definitely assured for Michigan in Grout Township, Gladwin County.

Sun Oil Co. 1 Linaberry, NE NW SE 10-13n-2w, Grout Township wildcat, showed oil saturation in first two cores cut in the Richfield between 5,006-95 ft. Oil-showing pays in the Richfield appeared to compare favorably with cored pays in other good Richfield oil pools, such as the Sun-discovered and developed North Hamilton field, Clare County.

No. 1 Linaberry will be drilled through the Richfield, into Black lime, to about 5,200 ft., total depth, where casing will be run and cemented in before pays are perforated and tested. A good test is not expected to be available for analysis of actual potential of this wildcat for about 10 days.

Sun's new deeper horizon wildcat is located in the older, and now abandoned Grout Dundee field, and is the first test to drill to the Richfield in this area. The Grout Dundee oil pool was discovered in 1940. There were four Dundee wells completed in this pool during initial development. Total production from Dundee was 34,262 bbl., an average of 343 bbl. per acre for the 100 acres credited to the field. All producers were abandoned in this pool in 1947 at the time that Sun discovered and developed the more prolific Kimball Lake Traverse oil pool, Newaygo County, and needed the casing and surface materials for use in that area. The bulk of the acreage around the new Grout wildcat is under lease tq Sun. Others with spreads of acreage that may be involved in a field development include William Asch and George Kovachs, Midland, Mich., independents, and the Pure Oil Co.

WESTERN CANADA

ALBERTA

Northwestern Alberta Wildcat Has Basal Quartz Gas Show

The team of Union Oil Co. of California and Hudson's Bay Oil & Gas Co. has discovered gas in the basal quartz horizon at Assineau No. 2-24 Lesser Slave Lake region wildcat in northwestern Alberta. This joint venture, operated by Union, is situated 3½ miles southwest of Assineau railpoint, on the south side of Lesser Slave Lake, about 140 miles northwest of Edmonton and 100 miles southeast of Peace River town.

Location of Union-H.B.-Assineau 2-24, is on LSD 2, 24-73-9w5. During drill-stem test in the basal quartz horizon, which was encountered at the 2,555-ft. level, gas flowed to the surface in 1 minute at the rate 1,020,000 cu. ft. daily and increased to 1,400,000 cu. ft. daily by end of the test.

Great Plains Development Co. of Canada Elkton No. 13-21 well 1½ miles south of the most southerly oil completion in the Harmattan oil field area, has assured the company of oil production from the Elkton member of the Mississippian formation. During a series of drill-stem tests run at this extension venture a gross pay section of 123 ft. was recorded in the zone, with 79 ft. being gas cap, and 44 ft. oil pay above the Shunda formation.

Drill-stem tests in the gas cap flowed at rates of up to 20,000,000 cu. ft. daily and recorded recoveries of distillate when pipe was pulled. The oil zone drill-stem tests run around the 8,995-ft. level measured a rate of 24.3 bbl. in 15 minutes when turned into tanks.

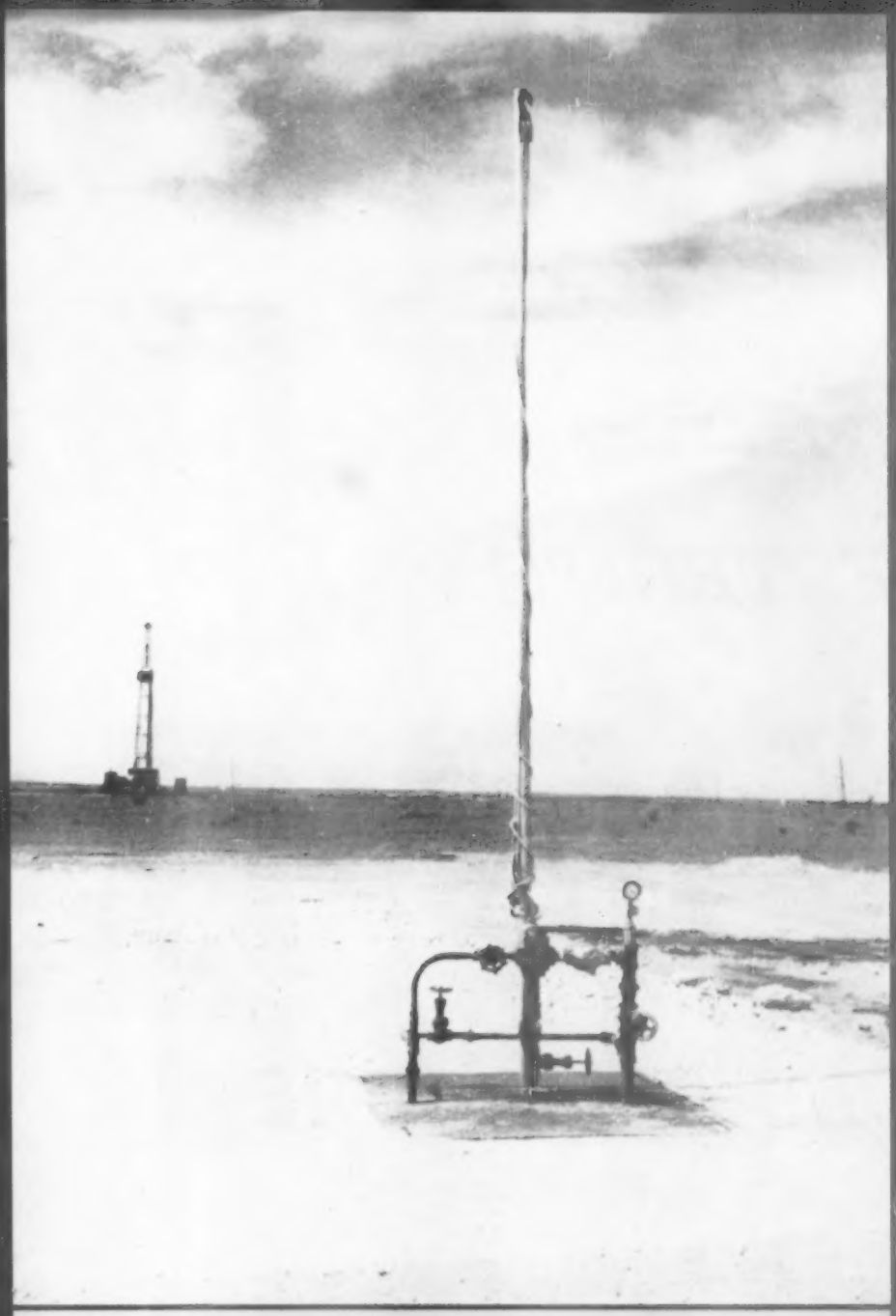
SASKATCHEWAN

Another Imperial Oil, Ltd. venture in southeast Saskatchewan has encountered enough encouragement during drill-stem tests in the Mississippian to warrant setting production casing in an effort to complete as a commercial oil producer. The new well is in the Frobisher area, 2 miles south of the southern tip of the Frobisher oil field and is the same approximate distance west-northwest of the town after which the field and the new discovery were named.

This new test, 7-15 Imperial-Frobisher, on LSD 7, 15-3-4w2, indicated its success from the porosity sector (Midale) of the Charles zone, and although no free oil was recovered on drill-stem test, oil-flecked mud was encountered on two consecutive tests run around the 4,750-ft. level.

Hudson's Bay Oil & Gas Co., Ltd. has chalked up another gas discovery in the Cessford-Bullpound Creek region of southeast Alberta according to results of drill-stem tests released by that company during the past week. The discovery was made in the Viking sand formation at the company's Northwest Cessford No. 1 wildcat that is situated 10 miles west-northwest of the Cessford gas field. The Viking yielded gas at maximum rate of 9.2 million cubic feet daily, while the Cretaceous, which is the main producing formation in the Cessford field, flowed gas at about 500,000 cu. ft. daily and also gave up mud, gas, and oil-cut mud on drill-stem tests. Production casing has been set through the Viking sand and the well has been capped.

Northwest Cessford No. 1, on LSD 6, 36-25-15w4, topped the Viking sand at 3,020 ft. and drill-stem test of the interval 3,015-45 ft. gave the 9,200,000 cu. ft. gas flow. Another test in the Viking, from 3,015-55 ft., yielded gas to surface in 1 minute, building up to 4.8 million cubic feet daily. Pipe recovery was 120 ft. of muddy salt water.



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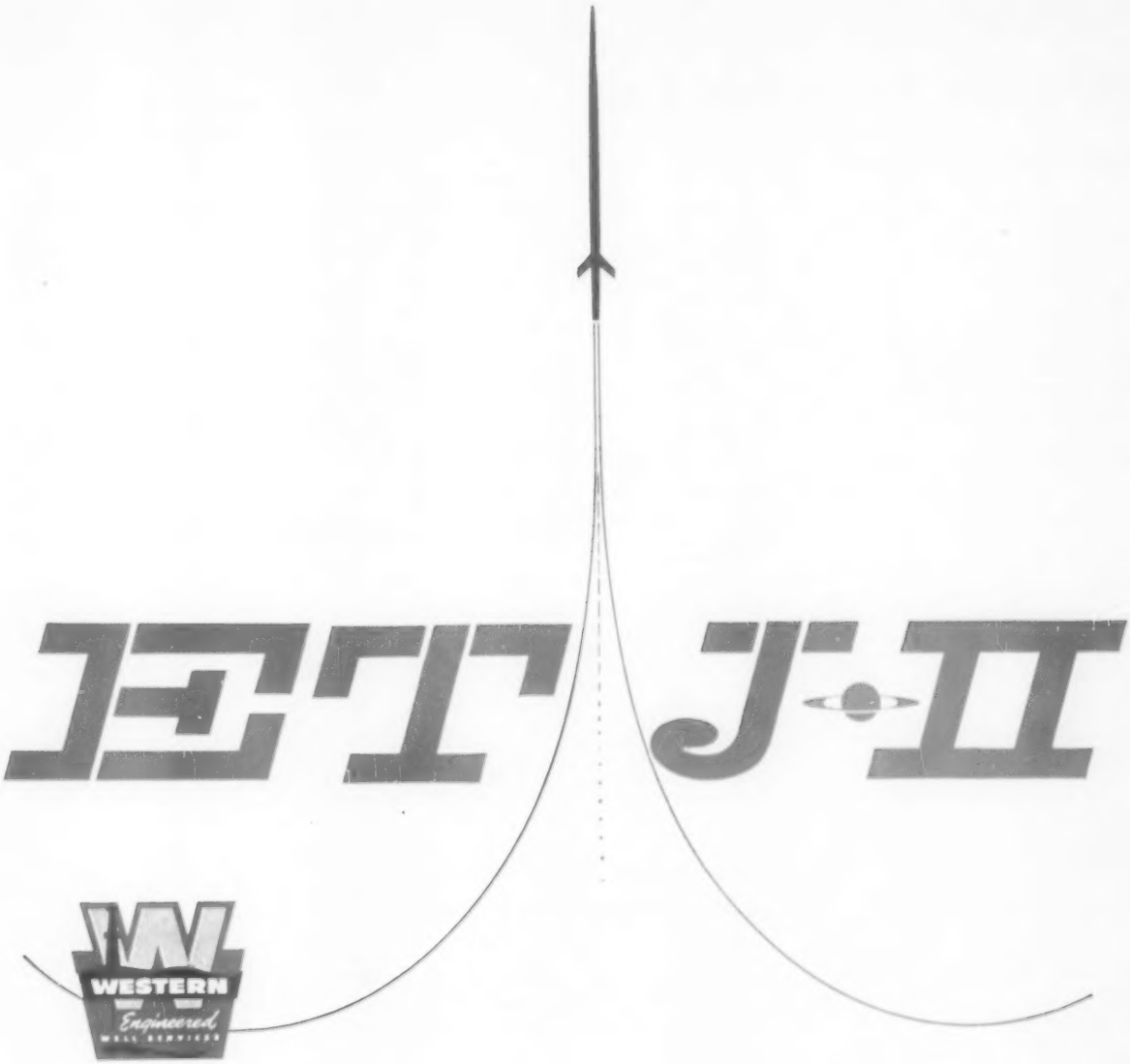

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SOUTH LOUISIANA

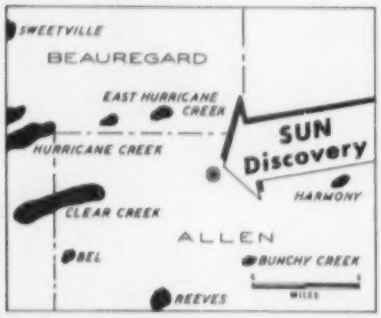
Little Bayou Pigeon Field Gets First Confirmation

OIL production discovered in the Little Bayou Pigeon area, Iberia Parish, in January 1955 finally is being confirmed after three unsuccessful attempts.

Confirmation is by Pioneer Oil & Gas Co. in its 1 Jeanerette, located 1,320 ft. east of Continental Oil Co.'s discovery well, 1-C Jeanerette. Production is from a 7,400-ft. Miocene sand. Pioneer's well is perforated at 7,444-51 ft., and Continental's at 7,447-53 ft.

The new producer flowed 130 bbl. of 36°-gravity oil per day through 7/64-in. choke.

Continental's three unsuccessful confirmation attempts were at locations north, south, and northwest of the discovery well.



Location (arrow) of Sun Oil Co.'s recently completed oil-discovery well on the actively explored Clear Creek trend across Allen and Beauregard parishes. The well, 1 Walker, in 32-5s-6w, is productive from a 5,200-ft. Frio sand (The Oil and Gas Journal, July 30, 1956, page 354).

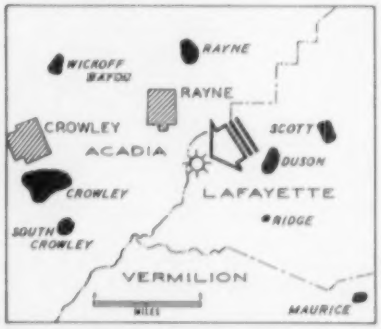
Third Pay Zone Produces In New Second Bayou Well

Magnolia Petroleum Co. has made a dual completion in its 3-A Lutcher in the second Bayou area of southwestern Cameron Parish. One of the well's sands, the upper with perforations at 12,460-12,500 ft. and 12,518-60 ft., previously had not been produced in the area. It gives the area three pay zones.

The well, the third for the area, and a south outpost, originally was completed last June as a single-pay producer in the discovery well's pay with perforations at 12,754-90 ft. and 12,806-36 ft.

The discovery well, drilled by Frankfort Oil Co. and completed last August, is productive at 12,869-82 ft. Frankfort's second well, the area's only other producer, was completed last January in a shallower sand, perforated at 12,012-32 ft.

All production so far has been gas and condensate.



Arrow points to J. P. Owen's recently completed deep gas-condensate discovery in western Lafayette Parish, near the Acadia Parish line (The Oil and Gas Journal, July 30, 1956, page 352). The discovery well, 1 Clement, 3 miles west of the Duson gas-condensate area, is completed in an 11,800-ft. zone.

LOUISIANA OFFSHORE

Successful Development Marks Gulf Offshore Field

Gulf Refining Co. clicked off its thirteenth producer last week in a steady, fairly rapid development of its Ship Shoal Block 154 field, in the Gulf of Mexico, more than 40 miles off the Terrebonne Parish shoreline. This field is Louisiana's farthest south field, although not the farthest from shore.

The new producer, 6-C OCS 0420, is completed in the field's 7,100-7,200 ft. sand with perforations at 7,072-7,104 ft. It is good for 192 bbl. of 35.9°-gravity oil per day, flowing through 9/64-in. choke with gas-oil ratio of 461 cu. ft. per barrel and pressure of 950 psi.

ARK-LA-TEX

NORTH LOUISIANA

Red Rock Field Grows

Carter Oil Co. completed the 1 Clyde Duke et al C-517 in SW SE 12-23n-9w, as the easternmost producer in deep Red Rock field, Webster Parish, in northwestern Louisiana.

This new well flowed 196 bbl. of oil per day on ⅛-in. choke from Smackover "B" zone perforations at 10,988-11,004 ft.

Franklin Parish Adds Paluxy Oil Field

Murphy-Sun completed the discovery well of Holt field in NW 28-16n-8e, Franklin Parish, northwestern Louisiana. The discovery well is the D-1 J. E. Holt.

The strike was finaled flowing at the rate of 158 bbl. of oil per day, 43° gravity. Perforations were in the Paluxy sand at 3,880-85 ft. The confirmation test will begin immediately at D-3 Holt in 28-16n-8e, 1,000 ft. east of the discovery.

SOUTHEASTERN STATES

MISSISSIPPI

Three New Oil Discoveries Pep Up Wilcox Exploration

Wilcox exploration, relatively quiet and unfruitful so far this year, perked up last week with three wildcat tests in southwestern Mississippi opening or showing promise of production from various sands in that formation.

Opening a new Wilcox field was Calto Oil Co. and others' wildcat, 1 Carter, in 44-5n-1e, in the southeast corner of Franklin County, near the intersection of the Adams-Wilkinson county lines. It was completed on the pump for 78 bbl. of 39.5°-gravity oil per day from perforations at 4,621-24 ft. in the top Wilcox sand. Total depth is 6,858 ft. The discovery is designated as Dixie field.

About 6,800 ft. northwest across the county line in the southeastern corner of Adams County, and just north of the Wilkinson County line, Rimrock-Tidelands, Inc., is testing an indicated Minter-zone discovery. Its 1-A U.S.A., in 31-5n-1w, flowed 108 bbl. of oil per day during a test through ⅛-in. choke. Pay is perforated at 6,654-55 ft. It is 1¾ miles north of Ireland field, on the Wilkinson County side of the line.

In the extreme southwestern corner of Adams County, John S. Callon is preparing to test the Wilcox-McKittrick sand in his 1-P Armstrong, in 16-5n-3w. He logged 10 ft. of net oil sand at 6,280-90 ft. in that zone, and spotted showings in the Parker zone at 6,392-95 ft. Hole was drilled to 6,710 ft. Location is just across the Mississippi River from Esperance Point field, in Concordia Parish, Louisiana.

WEST TEXAS-NEW MEXICO

WEST TEXAS

Gaines County Wildcat Recovered Mississippian Oil

A drill-stem test in the Mississippian at Jake L. Hamon and U. S. Smelting, Mining & Refining Co. 1 Randolph developed some gas and reversed out 2,245 ft. of oil, and 1,565 ft. of oil and gas-cut mud. The test was open 6 hours and 10 minutes, covering the interval at 11,520-11,715 ft. Bottom-hole flowing pressure on the test reached 1,075 psi. Drilling was resumed, on a 12,500-ft. contract. Location is 22 miles east of Seminole, in Labor 12, League 285, Schleicher CSL Survey.

Irion County Ellenburger test . . . Irion County gained location for an Ellenburger wildcat by Murray Petroleum Co. The test will be 1 A. A. Sugg, 2 miles southeast of Arden in 45-10-SPRR Survey, in the northeastern corner of the county. Contract depth calls for 8,000 ft.

Stanolind Oil & Gas Co. will drill a ⅝-mile north offset to its discovery and lone producer in the North Sugg-Clearfork field, 21 miles west of Mertzon. Location is in 69-14-H&TC Survey. It will be drilled with rotary to 5,300 ft. The discovery, 1-D Ella Sugg, pumped 61 bbl. a day from pay at 4,380 ft.

Tom Green prospect . . . Dykes Drilling Co. 1 Duff, Section 1187, GC&SF Survey, in the southwestern corner of Tom Green County, reported oil shows while drill-stem testing Strawn limestone.

On a 2-hour test at 6,878-90 ft. gas surfaced in 10 minutes and recovery was 600 ft. of 44° oil, plus 240 ft. of mud and oil. Shut-in pressure reached 3,490 psi.

Tentative top of the Strawn at 6,878 ft. on elevation of 2,330 ft. was said to be 280 ft. high on the same marker at Murray Petroleum Co. 1 Henderson, which was recently completed dry at 7,463 ft. Murray Petroleum's test is located about 4 miles to the southwest, just over the county line in Schleicher County, in the abandoned Dove Creek area.

SOUTHEAST NEW MEXICO

Lea County Wildcat Has Permo-Pennsylvanian Flow

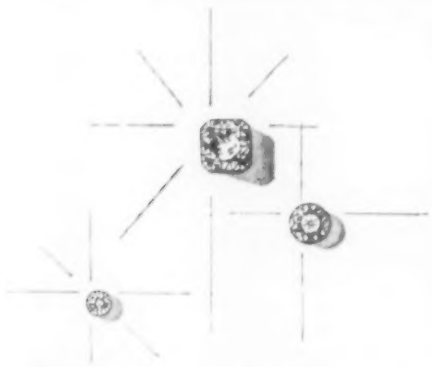
Phillips Petroleum Co. and Texas Pacific Coal & Oil Co. 1 Ranger, scheduled deep wildcat in SE SE 23-12s-34e, 9 miles west of Tatum in northern Lea County, made a heavy flow of oil from pay identified as Permo-Pennsylvanian.

The flow came on a 2-hour test at 10,270-10,385 ft. Gas surfaced in 47 minutes and oil in 55. It flowed to tanks for 40 minutes, making 28 bbl. of 44° oil. Gas-oil ratio was 1264:1 and flowing pressure ranged from 1,275-3,200 psi. Choke size was not reported. Operators prepared to drill ahead on a 13,200-ft. contract.

Lea wildcat dry . . . Haskins & Knickerbocker 1 Lane ranch, northern Lea County deep prospecter, was dry last week at total depth 12,120 ft. Formation tops reported were the Wolfcamp at 8,610 ft., and the Mississippian at 11,210 ft.

Cabot Carbon Co. 1 Reed, outpost to the King-Devonian test, has had drill-stem tests with oil shows in the Devonian. At 12,391-12,500 ft., recovery was water blanket, 1,890 ft. of gas, 90 ft. of oil and 450 ft. of oil and gas-cut mud.

Ralph Lowe, Ltd., has scheduled a second test for the North Gladiola-Devonian field. It will be the 1 Azrec-Adamson, and location in NE SW 5-12s-38e, is ¾-mile southeast of Lowe 1 Wallace, opener and only producer in the field.



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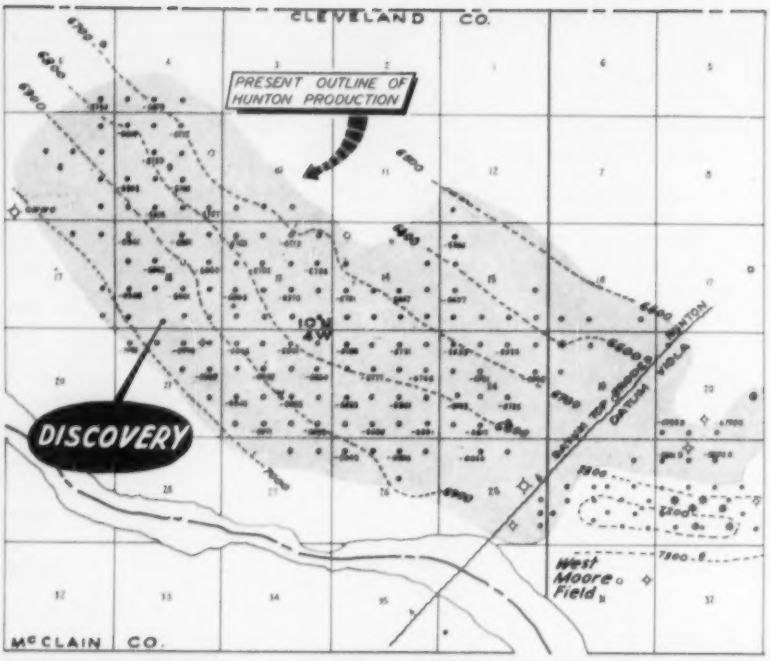
SHORT JUNCTION lies on the west flank of the Oklahoma City uplift. Fig. 1.



NOTICE THE PRODUCTION at Short Junction bears little relationship to structure. Oil in the porous Bois d'Arc section of the Hunton limestone is trapped at the Pennsylvanian unconformity. Fig. 2.

Short Junction Hits 98 Per Cent

by Norman S. Morrisey
Drilling Development Editor

THE drilling success ratio at Oklahoma's Short Junction field is better than 98 per cent. Since the discovery of the field, there have been 163 successful oil wells, and only 3 dry holes. Pay zone is the Hunton limestone and drilling depths range from 7,600-8,000 ft.

Short Junction has expanded rapidly since December 1955. Then the field had 50 oil wells; today the number exceeds 163.

Production is from the truncated edge of the porous Bois d'Arc limestone in the upper part of the Hunton. Downdip wells have established the oil-water contact. Updip, the pay zone has been stripped off by erosion.

Although Short Junction has a long way to go before it will rival its neighbor, West Edmond, the similarity between the two oil fields is striking. At West Edmond, the Hunton reservoir is a stratigraphic trap with production largely from the porous Bois d'Arc section. This field covers 32,000 acres. Cumulative production to date at West Edmond is 3,300 bbl. per acre and the ultimate production from the entire field is estimated at 130 million barrels of oil.

Short Junction now covers approximately 10,000 acres that are proved or semiproved by drilling. Most of the recent development drilling has been to the southeast. Updip and downdip the producing limits have been defined, but the northwest and southeast edges of production are still unknown.

The Hunton production at West Moore already has been linked to Short Junction. An-Son Petroleum Corp. has extended Hunton production at West Moore nearly 1 mile to the east. An-Son 1 Hoover (NW SE 21-10n-3w) made 35 bbl. of oil in 17 hours after acid treatment.

MID-CONTINENT

OKLAHOMA

Hoxbar Test Flows

Stanolind et al 1 Bradfield unit, Garvin County, flowed 242 bbl. of oil in 23 hours on a production test of the Hoxbar (Pennsylvanian) sand, topped at 4,470 ft. Test was made on 11/64-in. choke, through perforations from 4,485-90 ft. Gravity is 32°. Total depth of the well was 10,810 ft., plugged back to 4,500 ft. Stanolind owns a 32 per cent interest in a 640-acre unit and is the operator, with the remaining interest owned by Republic Natural Gas Co. and others. Additionally, Stanolind holds substantial acreage outside the unit. Location is 4-1n-2w.

Caddo Records Hit Of Year for State

The most important wildcat discovery so far this year in Oklahoma is in the making at Sinclair Oil & Gas Co.'s 1 Susie in C NW SE 1-6n-13w, Caddo County.

The well flowed oil at the estimated rate of 50 bbl. per hour on test of the first Bromide sand at 8,744-91 ft. A test in the second Bromide sand at 8,871-8,916 ft. recovered 80 ft. of oil and 210 ft. heavily oil and gas-cut mud on 1-hour opening. Testing continues.

This wildcat is located in the southwestern portion of the Anadarko basin, directly north of the Wichita Mountains in a highly faulted area. The area has

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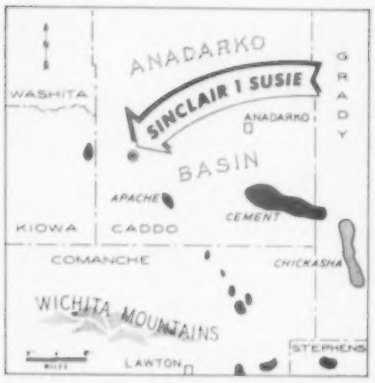

Sinclair Oil & Gas Co. has the most significant discovery of the year for Oklahoma at its 1 Susie in Caddo County, northwest of Apache-Simpson field.

been worked for years in hopes of a possible extension to the Apache fault trend that extends southeast-northwest. Magnolia drilled a 17,600-ft. dry hole northwest of the Sinclair well, apparently on the downthrown side of the Apache fault trend. Sinclair also drilled a dry 11,000-ft. hole in the same section as their discovery well, just northwest of the 1 Susie.

PACIFIC COAST

CALIFORNIA

Richfield Reports Good Test On Wheeler Ridge Wildcat

Richfield Oil Corp. reported it had a good test on 16-30 Richfield-Mohawk, a wildcat being drilled midway between Wheeler Ridge field and Tejon field in southern Kern County. On a formation test at 8,219 ft. gas and fluid surfaced rapidly. The gas flowed at a rate of 4,000-5,000 M.c.f. daily. Nearest production is at Tejon field 2 miles southeast. Nearest Wheeler Ridge production is more than 3 miles west.

Western Scores at Santa Fe

Western Gulf Oil Co.'s closely watched 1 Newgate, located 1 mile east of the new Santa Fe pool discovery in Santa Fe Springs field, was completed flowing 378 bbl. daily, 68 per cent cut, of 32°-gravity crude. The producing interval is 8,888-9,012 ft., which corresponds in depth with the Santa Fe Springs pool which recently touched off a drilling boom in this old Los Angeles County field. However, development work information plus the highly faulted nature of the entire area points to Western's wildcat being completed in a new pool rather than in the Santa Fe pool.

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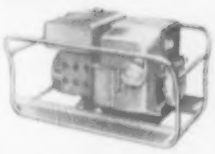

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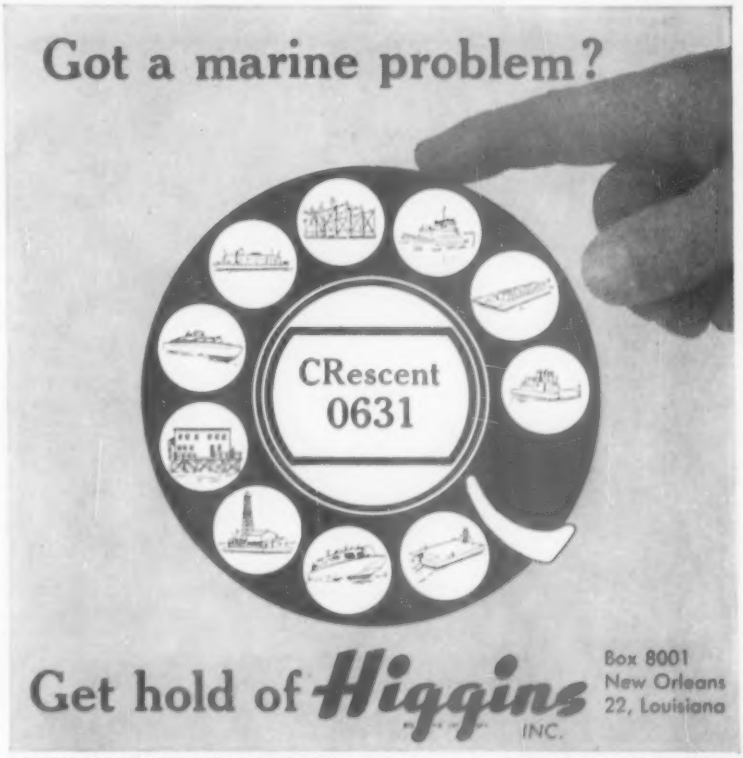

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SOUTH TEXAS

SOUTHWEST TEXAS

New Vicksburg Production Opens in Jim Wells County

Republic Natural Gas Co. is opening a new Vicksburg field in the northeast corner of Jim Wells County. Its discovery well, 2 Vetters, 2 miles southeast of Sandia, flowed oil under 1,250-psi. pressure while cleaning through ⅛-in. choke. No gage was made of the flow. The well is shut-in pending potential tests. Pay is perforated at 5,346-48 ft. with bottom of hole at 5,821 ft. Republic recently took over the operation from H. R. Smith.

S. H. Howell's Vicksburg discovery well 8 miles northwest of Alice, in the western part of the county, was rated good for 98 bbl. of 45.5°-gravity oil per day on potential gage. Flow was through ¼-in. choke. Its pay is perforated at 4,642-45 ft. in hole bottomed at 4,775 ft.

Captain Lucey field, northeast of Sandia, in the northeastern corner of the county, got another pay zone in a discovery by J. A. Kimmey at his 4 Muil. The new pay in the H-2 sand is perforated at 4,068-82 ft., where it flowed at the rate of 106.64 bbl. of 28.6°-gravity oil per day under pressure of 250 psi. with gas-oil ratio of 240 cu. ft. per barrel.

Atascosa County Wildcat Tests Escondido Oil Show

A drill-stem test of a 3-ft.-section in the Escondido formation in Hillsman-Greenburg's wildcat, 1 Proll, 4 miles west of Jourdanton, indicates discovery of another new producing area in Atascosa County. The test, taking in a 21-ft. interval at 4,562-83 ft., recovered 40 ft. of oil-cut mud. The indicated pay has been passed up for the time being.

Prado Field Adds New Pay

Gorman, Giergart & Howe have a new oil-pay in their Prado field, 15 miles southwest of Hebbronville, in northwestern Jim Hogg County. Their 4-B East, testing 5 ft. of sand at 3,743-48 ft., flowed 110 bbl. of 39.6°-gravity oil per day through 9/64-in. choke with pressure of 340 psi. The well found the field's Loma Novia sand dry. A 50-ft. shale break separates the two zones.

TEXAS GULF COAST

Wildcat Discovery Opens New San Patricio Field

A discovery by Plymouth Oil Co. is giving San Patricio County another new producing area. It is located 5 miles west of Sinton in the Mrs. L. A. Rogers Survey. The discovery well, 1 Cockerham, produced 37.28 bbl. of 33°-gravity oil on a 24-hour test through 9/64-in. choke. It had pressure of 250 psi. and gas-oil ratio of 1,288 cu. ft. per bbl. Its completion is in a Vicksburg sand, perforated at 5,784-89 ft.

The well previously tested a deeper sand, perforated at 6,019-24 ft., from which it flowed at the rate of 1,440,000 cu. ft. of gas with 14 bbl. of condensate per day before going to water.

"Cockerham" is expected to be the name of the new area. Location is 3½ miles east of East Mathis field.

Ten Wells Completed In Busy Pierce Junction Week

Continued active development of flank sands around the old Pierce Junction salt dome at the south edge of Houston added at least 10 more wells last week. These boost to more than 120 the number of wells which have drilled in the present play, which had its inception late in 1954 but which did not reach large-scale proportions

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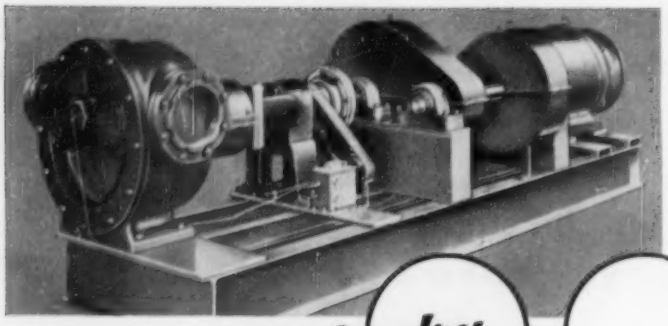

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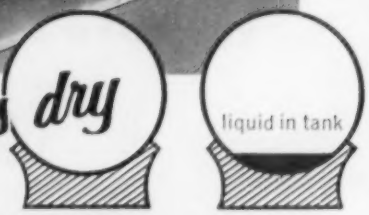

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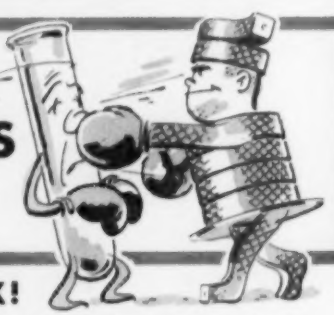

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until late last year. With no letup in drilling, this development remains the greatest concentration of activity anywhere on the Gulf Coast.

Included in completions last week was a confirmation of the recent extension of Vicksburg production to the southeast flank of the dome. Main activity until now has extended from the east side around the north to the northwest side of the dome. The southeast confirmation was by Beck Oil Co. at its 2 Whitby, which was productive (176 bbl. of 39.6°-gravity oil per day through 9/64-in. choke) from the Vicksburg pay at 8,180-96 ft.

Three additional tests are getting under way on the far west flank of the dome in an extension of exploration farther around the dome from the northwest side activity. Two of these, both set up for 9,000-ft. tests, will be drilled by Paul Paulson, of Houston, and the other, a 7,800-ft. permit, by Arnold H. Brunner and Hugh Fitzgerald, of Dallas.

Baldwin Area Produces From New Frio Reservoir

Discovery of another Frio-sand oil-reservoir has been made by Magnolia Petroleum Co. in the Baldwin area, 4 miles south of Clarkwood, in Nueces County.

Discovery well, 23 Baldwin, was drilled to 8,516 ft. Producing interval is 6,962-63 ft. with casing run to 7,899 ft. Tested through 3/16-in. choke, it flowed 207.06 bbl. of 45.1°-gravity oil per day with pressure of 2,100 psi. and gas-oil ratio of 4,589 cu. ft. per bbl.

Second Producer Confirms Blue Ridge Vicksburg Pay

Recent discovery of production in Vicksburg sands off the east flank of the old Blue Ridge dome is being confirmed by completion of the new area's second well.

This well, drilled by General Crude Oil Co., is 800 ft. west of Christi, Mitchell & Mitchell's discovery well, 1 Dillard, completed last May as a 350-bbl. well (5/32-in. choke) from pay at 7,880-90 ft.

General Crude's well, 1 McCrory fee, flowed at the rate of 214 bbl. of 30.8°-gravity oil per day through ⅛-in. choke with pay 100 ft. higher at 7,776-80 ft. It had pressure of 1,150 psi. and gas-oil ratio of 651 cu. ft. per barrel. Hole was drilled to 8,400 ft.

Elsewhere on the Blue Ridge dome, Phillips Petroleum Co. has completed a 10,500,000-cu. ft. (open flow) gas well in a shalwlow sand, perforated at 2,694-99 ft. The well is shut in with pressure of 1,180 psi.

Portion of ownership and oil development map of Anderson County, East Texas, showing the new fields around Slocum townsite. Fields have been outlined with pencil to show location, not according to dry hole definitions. Map courtesy Eby Engineering Co., Tyler.

Three new fields, two pays:

East Texas' Anderson County Is New Hot Spot

by Carl Hoot

ONE of East Texas' current hot spots is in southeastern Anderson County, around Slocum townsite. Main production is the Woodbine at 5,600-5,700 ft., although several smaller wells produce from the sub-Clarksville, just above the Woodbine. Gravity of the oil runs from 29° to 46° and a few scattered wells are gas-distillate.

Oil production for West Slocum (Woodbine) amounted to 27,963 bbl. during the first 4 months since its discovery in March of this year. At North Slocum (sub-Clarksville), 3-months' oil production following its discovery in April of this year was 13,825 bbl.

Background . . . Some of the Slocum fields were discovered in 1955 but the drilling play didn't get started until spring of this year. At this writing North Slocum field had 1 well drilling, 6 locations, and 1 in the completion stage. The latter well is in the northeast extension on the accompanying map. Pay was the sub-Clarksville at 5,691-93 ft. and completion potential through 13/64-in. choke was 225 bbl. of oil a day.

In South Slocum field, the main portion being 1½ to 2 miles south and slightly east of the townsite, two wells were in completion stage and two were locations. One of the wells extended production to the northeast but apparently is an edge well. Production was from the Woodbine at 5,862-70 ft. and initial potential was 28 bbl. of oil a day through 16/64-in. choke. Gas-oil ratio ran high at 9,342:1.

At West Slocum 2 were drilling, 3 were locations and 2 were making completion tests.

Discovery data . . . Going counterclockwise on the map, around Slocum townsite, the following wells were classed as pool-openers.

Slocum field . . . Traders Oil Co. of Houston 1 J. M. Vickery, 1 mile southwest of Slocum. Low-gravity oil was found in the shallow (490-528 ft.) Carrizo-Wilcox zone, and completion on the pump was for 5 bbl. of 19° oil. Nearest similar production is 30 miles to the south in Trinity field, Houston County. A few wells produced oil from the Carrizo at Camp Hill field, 3½ miles northwest of Traders' well, but the zone proved noncommercial and production discontinued. Completion was in 1955.

West Slocum . . . Oil Properties, Inc. 1 C. C. Wilson, William R. Wilson Survey, A-66, 2 miles southwest of Slocum townsite. Initial potential was 338 bbl. of 44° oil a day through ¼-in. choke, from Woodbine perforations at 5,740-42 ft. Location is about 2 miles from sub-Clarksville and Woodbine wells in South Slocum field, but separate by a stratigraphic gap, according to testimony before the Railroad Commission. Completion was in March 1956.

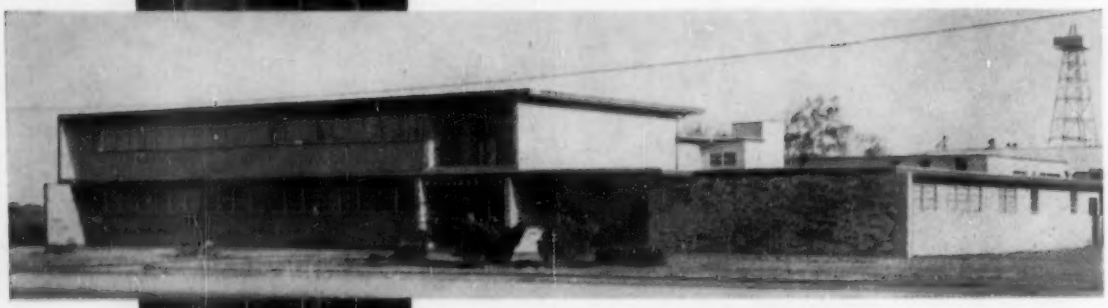
South Slocum (sub-Clarksville) . . . Apache Drilling Co. 1 Roland Gibson, 2¾ miles south of Slocum townsite in William T. Sadler Survey. Potential from perforations at 5,828-36 ft. was 28 bbl. of 36° oil a day. This well was dually completed from the sub-Clarksville and the Woodbine. Nearest comparable production was 7 miles south in Grapeland field (sub-Clarksville) but separated by fault and dry holes. Completion was in September 1955.

South Slocum (Woodbine) . . . Apache Drilling Co. 1 Mixer, W. T. Sadler Survey, 2 miles south of Slocum. Potential was 102 bbl. of oil a day through ¼-in. choke, from Woodbine perforations at 5,934-40 and 5,941-45 ft. Completion was in November 1955. This well is thought to be separated from a Woodbine gasser to the south by faulting.

North Slocum . . . Clardy & Barnett 1 C. H. Turner, W. R. Wilson Survey, A-66, ½ mile north of Slocum. This well opened sub-Clarksville pay in the area, and flowed 263 bbl. of oil a day through 12/64-in. choke, from open hole at 5,661-66 ft. Separation from the fields to the south is said to be by fault.

TOMORROW'S INSIGHT

For today's well logging



Pay zones even now are being found by the logging techniques of tomorrow. That's the result of insight—developed by the research, education and interpretation program in effect at Halliburton.

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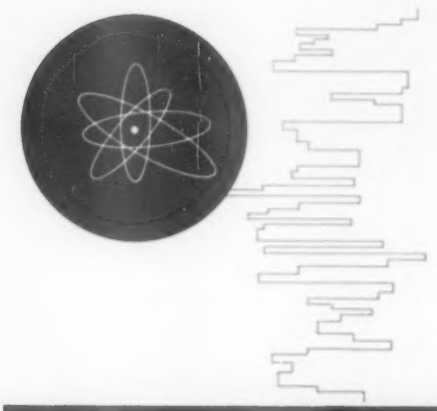


RADIATION SURVEY IN ANDREWS COUNTY

CLIMAXES IMPORTANT HALLIBURTON CONTRIBUTION

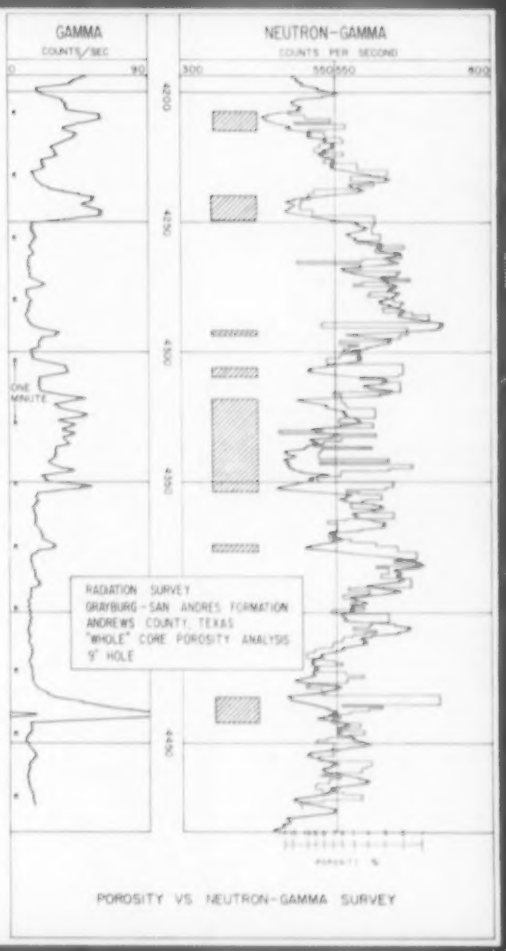
Logging Research Like This Throws New Light On Porosity

Here you see the enlightening results of one of the field tests recently performed by Halliburton to improve the oil industry's understanding of the relation between neutron response and formation porosity in carbonate reservoirs. The radioactivity log and long-section "whole core" data are from a well in the Grayburg-San Andres section of Andrews County, Texas.

The important feature is the close correlation between core porosities (red curve) and neutron counting rate, except where peaks in gamma curve indicate argillaceous material (cross-hatched blocks).

In preparation for these field tests, a relationship between neutron count, hole size and porosity was established for clean limestone. This was done by logging test holes of known porosity and variable hole diameters. From test well and field data, a nomograph has been prepared which for first time permits largely accurate porosity calculations to be made directly from neutron and caliper log data.

Thus again Halliburton research is tomorrow's insight for accurately directing well completions today.



POROSITY VS NEUTRON-GAMMA SURVEY

COMPLETE DATA SENT ON REQUEST

Ask for the publication "Halliburton Radioactivity Logging," containing radioactivity-caliper-porosity nomograph and data from test wells and field tests.

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NORTH TEXAS

New Wise County Pool Well Makes Big Flow

A pool well in northern Wise County, 4 miles west and slightly south of Alvord, has reported a heavy flow of oil on initial test of the pay.

Gulf Oil Corp. 1 Gertrude Boyd, Section 1, Cooke CSL Survey, A-156, ran a drill-stem test from 5,406-42 ft. Gas surfaced in 3½ minutes and oil in 12 minutes. In 1 hour it flowed 55.4 bbl. of 40° oil, with no water. Gas-oil ratio was 647:1.

New pay in Wise . . . Daniel Peterkin, Jr. 1 Ponder opened a new pay zone in Barrow-Conglomerate field 1 mile southeast of Chico in Wise County.

Twenty-four hour flow gage through 24/64-in. choke was 45 bbl. of oil, from pay between 5,266-80 ft. Offsetting conglomerate production is around 5,652 ft. Location is in W. Hersee Survey, A-410.

Jones County . . . A multi-pay prospect has been indicated for Jones County at Hack Drilling Co. 2 Mason estate, 15-17-T&P Survey, 5 miles southeast of Noodle. A 2-hour test in Swastika sand at 2,985-88 ft. recovered 360 ft. of oil, plus 120 ft. of oil-cut mud. At 2,998-3,005 ft., recovery was some gas and 15 ft. of oil-cut mud. Previously, in Gunsite lime at 2,829-40 ft. recovery was drilling mud with a show of oil.

Shackelford County . . . Panhandle Oil Corp. and Champion Winkler Oil Corp. 1 Midkiff, upper Moran discovery 1½ miles southwest of Moran, has been completed for a calculated 129 bbl. of oil a day. On flow test the well made 32.28 bbl. of oil in 6 hours through 18/64-in. choke from pay at 2,064-67 ft. Tubing pressure was 160 psi. Panhandle Oil Corp. holds all offset acreage.

Montague County . . . C. J. Brown 1 Flannery estate, wildcat 4 miles north of St. Jo, has been completed on the pump for 113 bbl. of 39° oil a day. Pay was not identified. Perforations were from 3,906-16 ft. Gas-oil ratio was 160:1 and total depth was 3,956 ft.

Successful Wildcats

CALIFORNIA

Sacramento County: E. L. Doheny 1 McCormack-Williamson, NW SW 30-5n-5e. IP 1,750 M.c.f. daily, 16/64-in., perforations 3,541-44 ft., TD 8,808 ft. (New gas field discovery 2 miles west of Thornton gas field.)

Kern County: Bandini Petroleum Co. 3 U. of C., NE NW 3-25s-18e. IP 200 BOPD, 10/64-in. 43.5°, perforations 3,553-61 ft. and 3,566-3,646 ft., TD 4,150 ft. (New fault block discovery on Alferitz anticline of Devils Den field.)

The Texas Co. 1 Breen, SE SW 14-28s-23e. IP 67 BOPD, 24/64-in., 34.4°, perforations 11,250-11,630 ft. and 12,040-12,140 ft., TD 13,733 ft. (New field discovery in Jerry Slough area.)

COLORADO

Logan County: Halbert, Jennings & Simic 1 State, C SE SW 35-8n-51w. IP 5,500 M.c.f. daily (estimated), spray distillate, "J" sand, top 4,680 ft. TD 4,851 ft. (New field.)

NEBRASKA

Kimball County: R. W. McDowell, Jr., et al 1 Lightbody, C SW NE 26-13n-57w. IPP 27 BO in 12 hours, "J" sand, top 6,930 ft. TD 7,024 ft. (New field.)

WEST TEXAS

Crane County: Atlantic Refining Co. 2-GG Blk. 31 Unit, 23-31-University Lands, 10 mi. NW Crane. IPP 133 BOPD, 26.8°, GOR zero, San Andres 3,200 ft. TD 4,337 ft.

Gulf Oil Corp. 363 Waddell, 7-4-H&TC, 9 mi. NE Grandfalls. IPP 98 BOPD, 34.9°, Tubb 4,400-75 ft. TD 7,530 ft.

Irion County: Stanolind Oil & Gas Co. 1-D Ella C. Sugg, 68-14-H&TD, 11 mi. N Barnhart. IPP 62 BOPD, GOR 970, 39°, Clear Fork 4,349-4,415 ft. TD 4,700 ft.

Woodward & Co. 1 Brooks, 15-3-H&TC, 5 mi. E Mertzon. IP 128 BOPD, 3/16-in., TP 780 psi., GOR 3880, 38°, Leonard perforations 5,132-38 ft.; IP 116 BOPD, ½-in., TP 80 psi., GOR 740, 40°, Strawn 6,495-6,505 ft. TD 7,215 ft. Dual discovery and completion.

Yoakum County: The Texas Co. 1 Woodward, 223-D-J. H. Gibson Sur., 8 mi. NW Plains. IPP 39 BOPD, 44°, GOR zero, Devonian 12,045-12,080. TD 12,273 ft.

J. D. Wrather, Jr., et al 1 Jones, 426-D. J. H. Gibson Sur., 1 mi. NW Plains. IPP 124 BOPD, 33°, GOR 306, San Andres 5,267-77 ft. TD 5,322 ft.

NORTH TEXAS

Grayson County: Nortex Oil & Gas Corp. 1 Harry Reast, Asahel Tuttle Sur., A-1193, 2 mi. S Sandusky. IPP 78 BOPD, 32°, GOR 200, pay 6,430-36 ft. TD 7,434 ft.

Samedan Oil Co. 1 Younger, Henry Stewart Sur., A-1076, 5 mi. SE Whitesboro. IPP 27 BOPD, 16°, GOR zero, Strawn 4,184-4,203 ft. TD 5,385 ft.

Wise County: Christie, Mitchell & Mitchell 1 Roy Robinson, Arnold & Scott Sur., A-21, 3 mi. NW Chico. IP 192 BOPD, 16/64-in., TP 200 psi., GOR 400, 41°, Strawn 4,370-94 ft.; IP 188 BOPD, 14/64-in., CP 580 psi., GOR 1200, 42°, Atoka conglomerate 5,674-86 ft. TD 5,878 ft. Dual discovery.

Young County: Rankin & Karper 1 Dozier, C. Hughes Sur., A-139, 5 mi. S Newcastle. IPP 34 BOPD, 40°, GOR 250, sand 3,138 ft. TD 4,634 ft.

SOUTHWEST TEXAS

Dimmit County: Colton & Colton and Kirkwood & Morgan L. Davis, T&NO Sur., Block 7, Section 15. IP 61.79 BOPD, 5/32-in., 43°, GOR 640 cu. ft. per bbl., perforations 2,736-43½ ft. (Navarro). TD 3,056 ft. (New reservoir in Wintergarden area—3 miles southwest of Carrizo Springs).

TEXAS GULF COAST

Chambers County: Continental Oil Co. 1 State Tract 2-3A, Trinity (Galveston) Bay. IP 149.5 BOPD, 7/64-in., 38°, perforations 9,197-9,202 ft. TD 9,528 ft. (New field—½ mile east of Fishers Reef field.)

Jefferson County: Brewster-Bartle Drilling Co. 1 State, J. W. Hedenberg Sur., A-912 2½ miles southwest of South Hillebrandt Bayou field). Shut-in gas well, no gage. TD 9,022 ft. (New field.)

Live Oak County: Kirkwood & Morgan, Inc., 3 Cummings, James McGloin Sur., A-25. IP 79.68 BOPD, 32/32-in., 39°, perforations 4,328-39 ft. TD 4,385 ft. (New field.)

Ralph Evans and Frank Kallina 1 Rankin et al, Jane Curry Sur., A-143. Shut-in gas well, no gage, perforated 4,461-66 ft. TD 5,454 ft. (New field.)

WEST CENTRAL TEXAS

Fisher County: General Crude Oil Co. 1 Dooley, 171-3-H&TC, 9 mi. SW Roby. IP 92 BOPD, 16/64-in., TP 50 psi., 43.5°, GOR 296, Ellenburger 7,230-60 ft. TD 7,260 ft., elev. 2,345 ft.

Jones & Stasney 3 Bryan, 184-1-BBB&C, 3 mi. NW Hamlin. IP 264 BOPD, 16/64-in., TP 200 psi., GOR 375, 42.5°, Canyon perforations 4,318-26, 4,353-57 ft. TD 5,450 ft. Elev. 1,773 ft.

Taylor County: Sid Katz 2 Thornton, Sec. 57, LAL Sur., 3 mi. S Potosi. IPP 42 BOPD, 40°, top pay 1,934 ft. TD 2,005 ft.

SOUTH LOUISIANA

Allen Parish: Sun Oil Co. 1 Walker, 32-5s-6w. IP 62 BOPD, 7/16-in., 25.6°, GOR 267 cu. ft. per bbl., perforations 5,180-84 ft. TD 9,515 ft. (New field).

Beauregard Parish: C. B. Webster, Harry Hurt, and Sohio Petroleum Co. 1 Bailey, 1-6s-9w. IP 200.1 BOPD, 9/64-in., 47°, GOR 598 cu. ft. per bbl., perforations 9,004-10 ft. (Cockfield). TD 9,300 ft. (New field—Southwest Hurricane Creek area).

Cameron Parish: Mecom Petroleums 1-D State Lease 1134, Block 45, West Cameron area, Gulf of Mexico. IP 25 BCPD and 1,500 M.c.f. daily, 3/16-in., perforations 9,644-56 ft. TD 10,136 ft. (New pay and extension in West Cameron Block 45 field).

Jefferson Parish: Richardson & Bass 1 Humble-State Lease 2707, 7-18s-24e. IP 1,302 M.c.f. daily and 75 BCPD, ⅛-in., 57.7°, perforations 10,411-17 ft. TD 13,812 ft. (New field—3 miles southeast of Lafitte field).

St. Charles Parish: Atlantic Refining Co. 1 Milling-Steinberg et al, 23-13s-19e. IP 147 BCPD and 5,880 M.c.f. daily, ¼-in., 41.7°, perforations 11,759-79 ft. TD 12,500 ft. (Extends Lake Des Allemands field).

NORTH LOUISIANA

Bossier Parish: Alden Bridge field: Cryer Drilling Co. 1 Montgomery, 2¼ miles northeast of Benton, 3 miles southeast of Cottage field in C SE SW SW 9-2n-13w. IPP 5 BOPD, no water, Buckrange sand 1,942-46 ft., 28.5°, TD 1,985 ft. (Oil discovery).

Caddo Parish: Mobley & Stephens et al 1 Chas. L. Horne, Jr., 7 miles east of Bethany field, 5½ miles south of Flournoy in C NE NE 21-16n-15w. IP 4,400 M.c.f. of gas per day, Travis Peak 6,134-6,502 ft. TD 6,528 ft. (Gas discovery).

Franklin Parish: Discovery of Holt oil field. Murphy-Sun D-1 J. E. Holt, 1½ miles southeast of Big Creek field in 28-16n-8e. IPF 158 BOPD, 9/64-in. choke, Paluxy sand 3,880-85 ft., 43°, GOR 525:1. TD 4,101 ft.

OKLAHOMA

Okfuskee County: Bell Oil Co. 1 Henry, 1¼ miles west of Northeast Halfway field in NW NW SW 10-13n-7e. IPF 240 BOPD, Dutcher sand 3,632-42 ft., ¼-in. choke, 40°. TD 3,700 ft.

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Oil explorer takes the helm . . .

. . . Rubel New Union President

UNION OIL CO. OF CALIFORNIA has a new president this week—the popular A. C. (Cy) Rubel, who stepped up from vice president in charge of exploration and production.

Rubel has been spearheading Union's field operations for 17 years during which time the company spread its activities into Canada and Latin America. He succeeds Reese H. Taylor in the president's office. Taylor was elevated to chairman of the board.

Other Union staff changes saw W. L. Stewart, former senior vice president, named vice chairman of the board and F. F. Hartley, director of research, elected a vice president. All of the promotions were voted at the regular directors meeting of Union early last week in San Francisco. They were effective August 1.

West from Kentucky . . . Rubel was born in Louisville, Ky., March 30, 1895, but migrated west to Arizona as a boy.

He was graduated from the University of Arizona in 1917 with a degree in mining engineering and metallurgy. He got out just in time to get involved in World War I. Before the fighting was over, young Rubel won the Distinguished Service Cross. He was discharged as a captain in the Corps of Engineers.

Below the border . . . With the war over, Rubel got into the oil industry.

He knocked around in Mexico, Guatemala, and Honduras as a geologist for various oil companies.

Hearing of Union's plans to open a petroleum engineering department, Rubel quickly applied for a job. He was hired in 1923 as an exploration geologist at Dominguez field.

He advanced steadily in the Union organization. In 1929 he became chief petroleum engineer and assistant manager of field operations. In 1931 he was promoted to manager of field operations and 5 years later was boosted to director of production. Rubel became a director of the company 2 years later and in 1939 was elevated to vice president in charge of exploration and production.

Pioneer work . . . Under Rubel's direction, Union has pioneered many developments in drilling techniques.

His years of experience in the field actively engaged in drilling, however, still have left Rubel with a healthy outlook on this uncertain phase of the oil business. His favorite humorous observation: "The successful driller is the one whose producers outnumber his dry holes by one."

Rubel's early career in Mexico and Central America has proven valuable in recent years. It helped him guide Union's expanded operations in Guatemala, Costa Rica, and Panama. Union's very successful work in Canada also has required his being absent on frequent business trips from home base in Los Angeles.

Concerned with industry . . . While admittedly not a "joiner," Rubel always has devoted much time to organizations concerned with the welfare of the industry and the nation's defense.

At present, he is vice chairman of the Military Petroleum Advisory Board, a member and former director of A.I.M.E., a member of American Petroleum Institute, and a member and past president of the Petroleum Club of Los Angeles.

He's popular over the industry and is still known as "Cy" to everyone in spite of his lofty position in the business. Both his employes and friends outside the company have nothing but nice words to say of the new Union president.

Eliot D. Ernst, former assistant manager of crude-oil purchasing for Pan American Production Co., Houston, has been moved to New York with American Oil Co. He will manage the crude-oil supply department. Ernst joined American's refinery at Texas City in 1947 and was transferred to Houston the next year.

Personals

Joseph W. Moorman has been appointed Mid-Continent district manager for James P. O'Donnell, consulting engineer with offices in New York and Beaumont, Tex.

David C. Phillips has been elected president of Falley Petroleum Co., Chicago. Phillips, associated with the company for several years, succeeds **G. F. Falley,** who has been named to the newly created post of chairman of the board.

Thomas Herndon and **Martin W. Shramm, Jr.,** have joined the staff of Alex W. McCoy Associates, Inc., geological consultants. Herndon was formerly with Continental Oil Co., Casper, Wyo. Schramm recently received his master's degree from the University of Pittsburgh.

Joseph D. Hollingsworth and **Jack H. Dubs** have joined the supply department of Tuloma Gas Products Co., Tulsa. Hollingsworth was formerly employed with Pan-Am Southern Corp. in New Orleans. Dubs was employed in the crude-oil coordinating section with Standard Oil Co. (Ind.).

Wayne P. Bradford has been transferred by Sinclair Oil & Gas Co. from Denver to Fort Worth as gas and gas-products division superintendent. Bradford joined Sinclair in 1933. Since 1954, he had served as gas superintendent at Houston and Denver.

Marling J. Ankeny, Bethesda, Md., has been named Bureau of Mines director. He succeeds **J. J. Forbes,** who retired last November. Ankeny, whose nomination was confirmed by the Senate July 19, is the tenth director of the bureau.

T. A. Pollard, formerly supervisor of the production-research division of Magnolia Petroleum Co.'s field research laboratory at Dallas, has been promoted to assistant to the director at the lab. **Dr. C. Ivan Alexander,** supervisor of the exploration-research division, has been appointed assistant director of the lab in addition to his present duties. **Dr. P. P. Reichertz,** with the production-research division since March 1943, has been named to replace Pollard as supervisor of the division. Pollard had been supervisor since March 1947. Alexander joined the company in 1933 as a geologist and was named supervisor of the exploration-research division in March 1952.

Personals

George Harrison has resigned his position as geologist with Shell Oil Co.'s Salt Lake City district.

Mark Dyott, recent graduate of Cornell University, has joined the Abilene, Tex., district office of Magnolia Petroleum Co. as a staff geologist.

John W. Bell, Jr., has joined Texas Pacific Coal & Oil Co. as district geophysicist for southern Louisiana. Bell is a former district geologist for Pan American Production Co.

E. D. Loughney, vice president and director of British American Oil Co., Ltd., has been elected a director of Trans Mountain Oil Pipe Line Co. Loughney succeeds **W. J. Wilkins** of Gulf Oil Corp.

Duval A. Davidson, Jr., has been transferred from assistant general superintendent of Pan American Production Co., Houston, to field superintendent of Stanolind Oil & Gas Co.'s Henderson, Tex., area. At Henderson, Davidson replaces **W. M. Jones,** transferred to Stanolind's Canadian division.

John L. Redmond, a geologist in Ohio Oil Co.'s Calgary production division, has been transferred to the company's subsidiary in Libya, North Africa, Oasis Oil Co. of Libya. Redmond is a graduate of the University of Tulsa, a member of Alberta Society of Petroleum Geologists and the A.A.P.G.

Floyd Brett, division manager for Sinclair Oil & Gas Co. at Midland, Tex., has been elected a vice president of the company. He is former assistant division manager for Sinclair in Fort Worth. Brett will continue his duties as division manager in Midland.

Robert O. McKinley has been appointed section leader of refinery economics division, Standard Oil Co. (Ind.). Other section leaders appointed are **Robert J. Austin,** heavy oils, asphalt, and ammonia division; and **John H. Lovett,** light oils division. **William L. Nemec,** refinery economics; **Robert H. Crowther** and **Francis J. Citek,** light oils, were appointed group leaders. **Robert W. Klipp** has been named general foreman of the analytical laboratory.

Burns Receives Honorary Degree from Alma Mater

H. S. M. Burns, president of Shell Oil Co., waits to receive an honorary doctor of laws degree from Aberdeen University, Scotland, while the promoter in laws reads a short history of Burns' accomplishments. Burns was capped by Sir Thomas Murray Taylor, principal of Aberdeen University, in the Mitchell Hall, Marischal College, Aberdeen. Burns graduated with a master's degree and bachelor of science degree at Aberdeen University, and a bachelor of arts at Cambridge University.

Bob Rapp has joined Oroco Oil & Gas Co., Payette, Idaho, as drilling and production superintendent.

Richard M. Martin, field engineer with Magnolia Petroleum Co., Duncan, Okla., has been transferred to Attica, Kans.

Henry A. Brainerd, mechanical engineer with Sinclair Pipeline Co., Independence, Kans., has been transferred to Harvey, Ill.

Harry Goodin has been transferred from San Angelo, Tex., to Dalhart, Tex., as party chief for Amerada Petroleum Corp.

Bernard Hutte, station engineer for Service Pipe Line Co., Casper, Wyo., has retired after 24 years of service. He will reside in Athens, N. Y.

Jack I. Burger, formerly gas evaluator with Pure Oil Co., Dollarhide, Tex., has been promoted to gas engineer in the Chicago office.

Cecil C. Miller, formerly party chief with Robert H. Ray Co., Seminole, Tex., has been promoted to seismic supervisor, Midland, Tex.

Arthur M. Van Damme, geophysicist for Gulf Oil Corp., has been transferred from the Fort Worth exploration office to Palermo, Sicily, where he will supervise seismic work for Gulf Italia, a Gulf Oil subsidiary.

Dolf W. Fieldman has joined the geological staff of William J. Carey, Grand Junction, Colo.

Neil A. Rice has been named vice president in charge of geology and engineering for Ambrosia Minerals, Inc. **Robert K. White** has been named vice president in charge of oil and gas departments.

W. J. Anderson, formerly executive assistant, Commonwealth Oil Refining Co., has been named head engineer, projects division, Standard Oil Co. (Ind.)

M. L. Miles, assistant division regional geologist with Gulf Oil Co., Fort Worth, has been transferred to Amarillo, Tex., as zone exploration geologist.

A. J. Parks, northern Louisiana district geologist for Arkansas Louisiana Gas Co., has resigned to join Cardinal Drilling Co. at Shreveport.

R. A. Bishop, manager, Regina, has transferred to Billings as division geologist for Sohio Petroleum Co., replacing **J. W. Johnson,** who has been transferred to northwest division as staff geologist. **H. G. Sehnert,** district geologist, Midland, succeeds Bishop. **Harold Kentta,** senior geologist, Casper, has been promoted to district geologist, Billings. Kentta replaces **D. E. Hayes,** who is being transferred to Oklahoma district as senior geologist.

Richard L. Fulcher, regional construction engineer for Continental Oil Co., Overland Park, Kans., has been transferred to Oklahoma City.

H. HOOVER, JR.

Herbert Hoover, Jr., under secretary of state, has been named to receive the Hoover Medal for 1956. The Hoover Medal was named for former President Hoover, the recipient's father. **Herbert Hoover, Sr.,** was the first honored with the medal. He received it in 1930. It is awarded to an engineer for distinguishd public service and sponsored by the American Institute of Mining, Metallurgical, and Petroleum Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Society of Civil Engineers.

Bob Bower, formerly petroleum geologist with Sun Oil Co., has joined the geological staff of Imperial Oil Co., Ltd., at London, Ont.

H. A. Jackson, Tidewater Oil Co. vice president, has retired after 35 years with the company. He was formerly general manager of Tidewater's Eastern Division.

Maury M. Travis, formerly district geologist, mineral classifications branch, U. S. Geological Survey, Casper, Wyo., has moved to Denver and is a consultant.

J. J. Plombon, formerly mechanical engineer with Shell Oil Co., Westwego, La., has been named chemical engineer with Minnesota Mining & Manufacturing Co., St. Paul, Minn.

G. L. Gardiner, former manager of Shell Oil Co.'s Shellburn refinery, Vancouver, B. C., has been appointed general assistant to the vice president, manufacturing. **G. A. Lorenz,** formerly assistant manager of Montreal refinery, succeeds Gardiner. **A. C. Hogge,** has been appointed assistant manager at Montreal, replacing Lorenz. **E. H. Tedford** has been named process superintendent at Montreal. **J. S. Ball,** formerly chief engineer at Shellburn refinery, has been appointed chief engineer at Montreal, replacing Tedford. **S. B. Moro** has been appointed chief engineer, Shellburn refinery, and **G. S. Merrifield** has been named assistant chief engineer. **S. J. Hutchinson** has been appointed assistant department manager, light ends, catalytic cracking unit, at Montreal.

R. F. McNamara, formerly with Ford, Bacon & Davis, Inc., has joined Arabian American Oil Co. as an engineer.

Phil Andrew, formerly geologist with Ada Oil Co., Houston, has been named district geologist for North Central Oil Corp., Lafayette, La.

C. T. Rankin, seismic party chief with Amerada Petroleum Corp., Durango, Colo., has been transferred to Evanston, Wyo.

Harry B. Kohlbush, formerly production superintendent with Harold C. Morton, has been named drilling superintendent with M. K. M. Oil Co., Casper, Wyo.

O. W. Stanley has resigned as geophysicist for Pan American Production Co., Houston, to join Chicago Corp., Fort Worth, in the same capacity. Prior to his service with Pan American, Stanley spent 7 years with Magnolia Petroleum Co. as a seismologist.

Robert D. Stanwood has been elected a vice president of Transcontinental Gas Pipe Line Corp. Stanwood has been in charge of the company's gas supply department and will continue to direct that phase of the business. He joined Transcontinental in 1951 after 11 years with Tidewater Oil Co.

Personals

James W. Law has been named vice president in charge of reservoir engineering for Nortex Oil & Gas Corp., Dallas. He is a graduate petroleum engineer of Louisiana State University and was associated with Superior Oil Co. from 1949 until 1956 as senior secondary-recovery engineer for the Mid-Continent division.

Merton E. Austin, division operating superintendent of the Michigan production division, Sun Oil Co., has exchanged positions with **Marvin L. Brown,** division operating superintendent for the Canadian production division.

J. G. D. Pratt, a British Petroleum Co. geophysicist, will accompany the British Trans-Antarctic expedition in an attempt to cross the Antarctic Continent via the South Pole. The expedition will leave Britain in November. Pratt will do gravity and seismic work.

Albert D. McCall and **W. Leo Morris** have joined the oil loan department of First National Bank & Trust Co., Tulsa. McCall has been with Shamrock Oil & Gas Corp. for the past 6 years as a petroleum engineer. Morris was formerly production supervisor for Magnolia Petroleum Co., in Tatum, N. M.

DEATHS

Watson B. Joyes, 65, retired independent oil producer, died July 28 in Tulsa. He was formerly associated with Lucey Products Co. and past manager of Ryan Consolidated Oil Co. During World War II he was petroleum consultant in Washington for Petroleum Administration for War.

Herbert Vison Crowder, 47, of Billings, Mont., geophysicist for Nance Exploration Co. of Houston, Tex., died recently at his home of a heart ailment. Crowder moved to Billings from Houston in 1953.

Frank Steele Craver, Sr., 78, independent Tulsa oil producer, died July 31 in Tulsa.

Fred W. Stork, 75, Saginaw, Mich., died July 13. He was founder and president of Stork Oil Co.

James Anderson, retired vice president and treasurer of Humble Oil & Refining Co., died July 29 in Houston. He was elected president of Humble Pipe Line Co. in 1920 and the next year named a director and vice president of Humble Oil & Refining Co.

George E. Stevens, 35, Carter Oil Co. engineer, died July 30 in Tulsa. Stevens joined Carter in 1947 and worked in Egypt, Sumatra, and Venezuela before coming to Tulsa.

William H. Burke, 49, Tulsa area production manager for Shell Oil Co., died July 28. Burke was a graduate of Leland Stanford University and joined Shell in 1933.

Edwin Murray Kelly, 45, Bakersfield, Calif., died July 25. He was superintendent of West States Oil Co.

Oil Show Booming

Entries setting record at coming Odessa exhibition

ODESSA, Tex.—Preparations are well along for what is certain to be the biggest Permian Basin Oil Show since the event's inception.

So far, exhibitors have taken more space for the October 18-21 running this year than for the last show in 1954.

Directors expect about 400 exhibitors and an estimated attendance of 200,000. These figures compare with 350 exhibitors and 140,000 in attendance in 1954.

Exhibits will present the latest developments in equipment and techniques in exploration, drilling, completions, corrosion mitigation, pumping, conservation, transportation, and processing.

The event also called the "Oil Field Workers' Show," is being billed as the nation's biggest single observance of Oil Progress Week. One of the feature attractions again this year will be a reconstructed "Boom Town."

The Permian basin show was conceived in a series of meetings of Odessa oil and supply men in 1949. It was decided to hold the attraction during Oil Progress Week in 1950. This first one attracted about 208 exhibitors and roughly 70,000 spectators. It has been repeated biennially since.

LEGAL

NOTICE OF SALE NO. 7
OF OIL AND GAS MINING LEASE
RESTRICTED INDIAN LAND

DEPARTMENT OF THE INTERIOR
BUREAU OF INDIAN AFFAIRS
CROW INDIAN AGENCY
CROW AGENCY, MONTANA

SEALED BIDS will be received until 2:00 P.M. Mountain Standard Time, **August 29, 1956,** and opened at that time in the office of the Superintendent of the Crow Indian Agency, Crow Agency, Montana, for the leasing of Units of restricted Indian Lands comprising **26,390.97** acres of land where the mineral rights are reserved for the benefit of the Crow Tribe by the Act of June 4, 1920, (41 Stat. 751-753), lands described on the attached sheets, located in Treasure and Big Horn County, Montana for oil and gas mining purposes. The sale will be conducted under regulations of the Secretary of the Interior, Title 25, CFR 195 (Act of June 4, 1920, 41 Stat. 751-753). Each unit to be bid on separately. The right is reserved to reject any and all bids and to disapprove any lease submitted on an accepted bid. The units of land are being offered subject to the approval of the Crow Tribal Council, and a separate lease will be drawn on the applicable forms for each unit. Should any bid be rejected or lease disapproved through no fault of the bidder, all deposits shall be returned to the bidder. The lease on lands to which minerals are reserved for the benefit of the Crow Tribe, Act of June 4, 1920 (41 Stat. 751-753) will be for a period of 10 years, from date of approval by the Secretary of the Interior or his authorized representative, with the right of renewal for an additional period to and including June 3, 1970, upon such terms and conditions as the Secretary of the Interior may prescribe and by showing to the satisfaction of the Secretary of the Interior that the leased premises are then producing oil or gas in paying quantities, provided, that any extension of any renewal lease beyond June 3, 1970, shall not be effective unless before that date such extension shall have been ratified by the Congress. Subject to the foregoing, leases will be sold to the bidder who offers the highest money bonus upon a per acre basis. Conditional or alternate bids will not be considered. No drilling propositions will be considered as a part of the bonus offer. **Each bid must be accompanied by a deposit in an amount not less than 25 per cent of the bonus bid.** All deposits are to be made by certified check or bank draft on a solvent bank, made payable to the **Bureau of Indian Affairs. Sight drafts will not be accepted.** The successful bidder or bidders will be required to pay their proportionate share of the advertising costs. Deposits from unsuccessful bidders will be returned. In the event two or more bids are in the same amount and such bids are the high bids, the bidders submitting such bids may be required to draw lots to determine the successful bidder. **IMPORTANT NOTICE:** All successful bidders will be required to prepare their own leases. Leases will be drawn on approved forms (special form is required for leases on land where minerals are reserved for the benefit of the Crow Tribe). Forms may be obtained from the office of the Superintendent, Crow Indian Agency, Crow Agency, Montana. Within 30 days after notification of being the successful bidder, said bidder must remit the balance of the bonus, the first year's rental, and his share of the advertising costs, together with a filing fee of $5.00 for each lease, and shall file with the superintendent the lease in completed form. The Superintendent may, for good and sufficient reasons extend the time for the completion and submission of the lease form, but no extension shall be granted for remitting the balance of monies due. If the successful bidder fails to pay the full consideration within said period, or fails to file the completed lease within the said period or extension thereof, or if the lease is disapproved through no fault of the lessor or the Department of the Interior, 25 per cent of the bonus bid will be forfeited for the use and benefit of the Indian lessor. **BONDS:** (a) Lessee shall furnish with each lease a bond (Form 5-154b), with an acceptable company authorized to act as sole surety, or with two or more personal sureties and a deposit as collateral security of any public-debt obligations of the United States guaranteed as to principal and interest by the United States, equal to the full amount of such bonds, or other collateral satisfactory to the Secretary of the Interior, or show ownership of unencumbered real estate of the value equal to twice the amount of the bonds. Lessee may file a bond on Form 5-154a without sureties and a deposit as collateral security of Government bonds equal in value to the full amount of the bond. Lease bonds shall be in the following amounts: For less than 80 acres, $1,000; For 80 acres and less than 120 acres, $1,500; For 120 acres and not more than 160 acres, $2,000; For each additional 40 acres, or part thereof above 160 acres, $500. PROVIDED, That a lessee may file one bond (Form 5-154f), in the sum of $15,000 for all leases of minerals in any one State and which may also include leases on that part of an Indian reservation extending into States contiguous thereto, to which the lessee may become a party: PROVIDED FURTHER, That the total acreage covered by the bond shall not exceed 10,240 acres. (b) In lieu of the bonds required under paragraph (a) of this section, a lessee may furnish a bond (Form 5-156) in the sum of $75,000 for full nationwide coverage with an acceptable company authorized to act as sole surety to cover all oil and gas leases and oil and gas prospecting permits without geographic or acreage limitation to which the lessee or permittee is or may become a party. (c) The right is specifically reserved to increase the amount of bonds and the collateral security prescribed in paragraph (a) of this section in any particular case when the officer in charge deems it proper to do so. The nationwide bond may be increased at any time in the discretion of the Secretary of the Interior. The rate of royalty will be 12½ per cent on all leases. The rental of $1.25 per-acre paid for any one year will be credited on the royalty for that year. A charge of $1.00 will be made for each set of lease forms. The adequacy of the bonus offer will be considered by the United States Geological Survey. The responsibility of complying with any requirement of the Federal Documentary stamp statutes will be left with the successful lessee. In addition to all other remedies provided by law, failure of the successful bidder to comply with terms of the sale will render all deposits theretofore made by or due from him subject to forfeiture without further action on the part of this office.

Method of future payment of rental and/or royalty: Payment on all approved Indian Oil and Gas Leases on lands located under the jurisdiction of this Agency should be made payable, when due, to the **Bureau of Indian Affairs** and transmitted to the Superintendent of the Crow Indian Agency, Crow Agency, Montana, THROUGH the Regional Oil and Gas Supervisor, U. S. Geological Survey, P. O. Box 400, Casper, Wyoming. All bids should be addressed to the Superintendent, Crow Indian Agency, Crow Agency, Montana, in a plain envelope marked "Bid for Oil and Gas Mining Lease, not to be opened until 2:00 P.M. Mountain Standard Time, **August 29, 1956.** Address all inquiries to: Superintendent Crow Indian Agency, Crow Agency, Montana.

L. C. Lippert
Superintendent.

DATED: **July 25, 1956.**

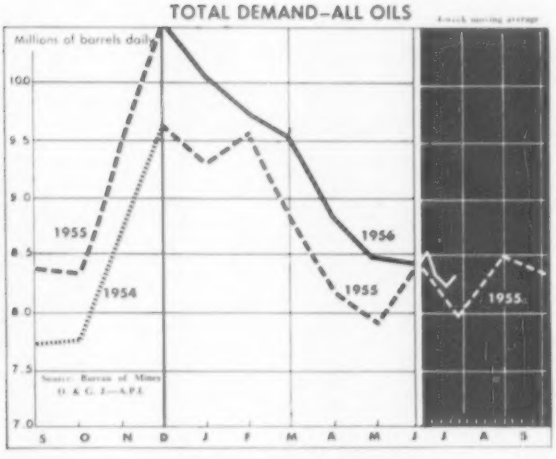
MINERAL RIGHTS RESERVED FOR THE BENEFIT OF THE CROW TRIBE BY ACT OF JUNE 4, 1920 (41 Stat. 751-753)

Unit No.	Description	Section	Acreage
	Township 4 North, Range 35 East, P.M.M.		
No. 1	Lots 1,2,3,5,6,7,8,9,10,11,12,	3	451.47
No. 2	Lots 2,3,6,7,8,9,10,11,12, $N\frac{1}{2}SE\frac{1}{4}$, $SE\frac{1}{4}SE\frac{1}{4}$, $E\frac{1}{2}SW\frac{1}{4}$, $NW\frac{1}{4}SW\frac{1}{4}$,	4	
	$NE\frac{1}{4}SE\frac{1}{4}$	5	
	$N\frac{1}{2}NW\frac{1}{4}$,	9	729.68
No. 3	$SW\frac{1}{4}SW\frac{1}{4}$,	8	40.00
No. 4	$N\frac{1}{2}$, $SE\frac{1}{4}$, $E\frac{1}{2}SW\frac{1}{4}$, $SW\frac{1}{4}SW\frac{1}{4}$,	11	600.00
No. 5	$S\frac{1}{2}NE\frac{1}{4}$,	13	80.00
No. 6	$NW\frac{1}{4}NW\frac{1}{4}$,	13	
	$N\frac{1}{2}N\frac{1}{2}$, $SW\frac{1}{4}NW\frac{1}{4}$, $NW\frac{1}{4}SW\frac{1}{4}$,	14	
	$N\frac{1}{2}SE\frac{1}{4}$, $SE\frac{1}{4}SE\frac{1}{4}$, $NE\frac{1}{4}SW\frac{1}{4}$,	15	440.00
No. 7	$S\frac{1}{2}$, $NW\frac{1}{4}$, $SE\frac{1}{4}NE\frac{1}{4}$,	25	520.00
No. 8	$N\frac{1}{2}$, $SE\frac{1}{4}$, $N\frac{1}{2}SW\frac{1}{4}$, $SE\frac{1}{4}SW\frac{1}{4}$,	26	
	$E\frac{1}{2}E\frac{1}{2}$, $SW\frac{1}{4}SE\frac{1}{4}$,	27	800.00
No. 9	$SE\frac{1}{4}NW\frac{1}{4}$, $NE\frac{1}{4}SW\frac{1}{4}$, $NW\frac{1}{4}SE\frac{1}{4}$,	29	120.00
	Township 5 North, Range 35 East, P.M.M.		
No. 10	Lots 1,2,3,4, $S\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}$	5	640.24
No. 11	Lots 1,2,3,4,5,6,7, $S\frac{1}{2}NE\frac{1}{4}$, $SE\frac{1}{4}NW\frac{1}{4}$, $E\frac{1}{2}SW\frac{1}{4}$, $SE\frac{1}{4}$,	6	633.95
No. 12	Lots 1,2, $E\frac{1}{2}NW\frac{1}{4}$, $E\frac{1}{2}$	7	477.04
No. 13	All	8	640.00
No. 14	$NW\frac{1}{4}$,	13	
	All	14	800.00
No. 15	All	17	640.00
No. 16	Lots 2,3,4, $SE\frac{1}{4}NW\frac{1}{4}$, $E\frac{1}{2}SW\frac{1}{4}$, $SE\frac{1}{4}$,	18	396.22
No. 17	Lots 1,2,3,4, $E\frac{1}{2}W\frac{1}{2}$, $E\frac{1}{2}$,	19	635.60
No. 18	$S\frac{1}{2}$, $NW\frac{1}{4}$, $S\frac{1}{2}NE\frac{1}{4}$,	20	560.00
No. 19	$N\frac{1}{2}$, $W\frac{1}{2}SW\frac{1}{4}$,	21	400.00
No. 20	$W\frac{1}{2}W\frac{1}{2}$,	24	160.00
	Township 5 North, Range 35 East, P.M.M.		
No. 21	$E\frac{1}{2}SE\frac{1}{4}$,	24	80.00
No. 22	$S\frac{1}{2}$,	26	320.00
No. 23	Lots 1,2,3,4, $E\frac{1}{2}W\frac{1}{2}$, $N\frac{1}{2}NE\frac{1}{4}$, $SE\frac{1}{4}NE\frac{1}{4}$ $S\frac{1}{2}SE\frac{1}{4}$, $NE\frac{1}{4}SE\frac{1}{4}$,	31	558.71
No. 24	$W\frac{1}{2}$, $S\frac{1}{2}SE\frac{1}{4}$,	32	400.00
No. 25	All	33	640.00
No. 26	All	34	640.00
No. 27	$S\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}$	35	480.00
	Township 4 North, Range 36 East, P.M.M.		
No. 28	Lots 1,2,3,4,5,6,7,8,9,10,11, 12, $S\frac{1}{2}$,	1	806.84
No. 29	Lots 1,2,3,4,5,6,7,8,9,10,11, 12, $S\frac{1}{2}$,	2	806.64
No. 30	Lots 1,2,3,4,5,6,7,8, $S\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}$,	3	806.20
No. 31	Lots 1,3,4,5,6,8, $SE\frac{1}{4}$, $S\frac{1}{2}SW\frac{1}{4}$, $NW\frac{1}{4}SW\frac{1}{4}$,	4	525.21
No. 32	$S\frac{1}{2}N\frac{1}{2}$, $SW\frac{1}{4}$, $W\frac{1}{2}SE\frac{1}{4}$, $NE\frac{1}{4}SE\frac{1}{4}$,	5	440.00
No. 33	All	11	640.00
No. 34	$E\frac{1}{2}$, $SW\frac{1}{4}$,	13	480.00
No. 35	All	14	640.00
No. 36	$S\frac{1}{2}NE\frac{1}{4}$, $SE\frac{1}{4}NW\frac{1}{4}$, Lots 3,4, $E\frac{1}{2}SW\frac{1}{4}$, $SE\frac{1}{4}$,	18	435.02
No. 37	Lots 1,2,3,4, $E\frac{1}{2}W\frac{1}{2}$, $E\frac{1}{2}$	19	631.60
No. 38	All	20	640.00
No. 39	All	21	640.00
No. 40	$N\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}NW\frac{1}{4}$,	22	240.00
No. 41	All	24	640.00
No. 42	All	27	640.00
No. 43	$SW\frac{1}{4}SW\frac{1}{4}$,	28	
	All	29	680.00
No. 44	Lots 1,2,3,4, $E\frac{1}{2}W\frac{1}{2}$, $E\frac{1}{2}$,	30	633.04
No. 45	Lots 1,2,3, $E\frac{1}{2}NW\frac{1}{4}$, $NE\frac{1}{4}SW\frac{1}{4}$, $NE\frac{1}{4}$,	31	394.75
	Township 5 North, Range 36 East, P.M.M.		
No. 46	Lots 1,2,3,4, $S\frac{1}{2}N\frac{1}{2}$,	3	319.36
No. 47	Lots 1,2,3,4, $S\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}$,	4	639.40
No. 48	$W\frac{1}{2}$, $W\frac{1}{2}SE\frac{1}{4}$,	20	400.00
No. 49	$E\frac{1}{2}$, $SW\frac{1}{4}$, $E\frac{1}{2}NW\frac{1}{4}$, $SW\frac{1}{4}NW\frac{1}{4}$, $S\frac{1}{2}NW\frac{1}{4}NW\frac{1}{4}$, $NE\frac{1}{4}NW\frac{1}{4}NW\frac{1}{4}$	22	630.00
No. 50	All	23	640.00
No. 51	$NW\frac{1}{4}SW\frac{1}{4}$, $S\frac{1}{2}S\frac{1}{2}$,	27	200.00
No. 52	$SW\frac{1}{4}NE\frac{1}{4}$, $NW\frac{1}{4}$, $NE\frac{1}{4}$, $NE\frac{1}{4}SE\frac{1}{4}$,	28	
		29	400.00
No. 53	$E\frac{1}{2}$, $SW\frac{1}{4}$, $E\frac{1}{2}NW\frac{1}{4}$, $SW\frac{1}{4}NW\frac{1}{4}$,	33	600.00
No. 54	All	34	640.00
	Township 7 South, Range 33 East, P.M.M.		
No. 55	$S\frac{1}{2}$,	29	320.00

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,101,950	DOWN	11,400	UP	465,303
Crude stocks	274,927,000	DOWN	205,000	UP	4,900,000
Completions	1,162	UP	111	UP	16
Refinery runs	7,990,000	DOWN	86,000	UP	413,000
Gasoline stocks	177,052,000	DOWN	1,300,000	UP	20,047,000
Kerosine stocks	28,883,000	UP	514,000	DOWN	3,117,000
Distillate stocks	113,600,000	UP	4,866,000	DOWN	2,336,000
Residual stocks	43,168,000	UP	1,004,000	DOWN	2,289,000
Four-product stocks	362,703,000	UP	5,084,000	UP	12,305,000
Total imports	1,444,900	UP	392,800	UP	257,600



Light-Product Stock Total Is Fair; But the Balance by Products Is Poor

CURRENT trends point to a lack of balance in light-product stocks at the end of the summer unless refinery yields are shifted in August.

At this time of the year, gasoline inventories should be dropping rapidly while stocks of middle distillate fuels are building at an even faster pace. While traveling in opposite directions, the paths of these products normally cross in August.

The trend of the postwar period has tended to move the time of crossing nearer to the middle of summer. For the years 1946 and 1947, middle-distillate stocks did not reach the gasoline-stock level until October. Stocks of these products reached the same level in September in each of the next 3 years. The crossing has been in August every year since 1950 with the one exception of the abnormal year 1954 when the common level was reached sometime early in September.

At the end of April this year, gasoline inventories exceeded the total for middle distillate by 111,500,000 bbl. compared with a stock difference of 84,000,000 bbl. at the same time last year. Using the 1955 figures as a base, light-product inventories this year were out of balance by 27,500,000 bbl.

No progress had been made in correcting the situation by the end of May. The gasoline-middle distillate differential at that time was 88,900,000 bbl. compared with 58,800,000 last year—out of balance by 30,100,000 bbl.

Weekly figures show that nothing was done in June to bring current stocks more in line with last year's program. On June 29 this year gasoline still topped middle distillate by 62,000,000 bbl. or 35,000,000 bbl. more than the differential at the end of June 1955.

By the end of July last year, the gasoline-stock total was only 5,200,000 bbl. more than middle distillate. The chart lines of these stocks crossed in August with middle distillate ahead at the end of the month by 17,000,000 bbl.

The A.P.I. report for July 27 shows gasoline still 34,600,000 bbl. ahead of middle distillate. This difference probably was reduced slightly during the last few days of the month, maybe enough to bring it to 32,600,000 bbl.

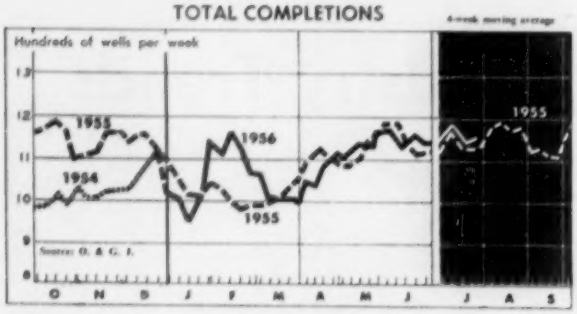
Since gasoline stocks exceeded middle distillate by only 5,200,000 bbl. at the end of July last year, progress toward bringing stocks in line with last year's program was enough in July to offset the losses in May and June.

If gasoline stocks at the end of July this year amounted to 32,600,000 bbl. more than middle distillate and the difference last year was only 5,200,000 bbl., the industry is about 27,400,000 bbl. behind last year in its program to bring these stock levels together by sometime in August.

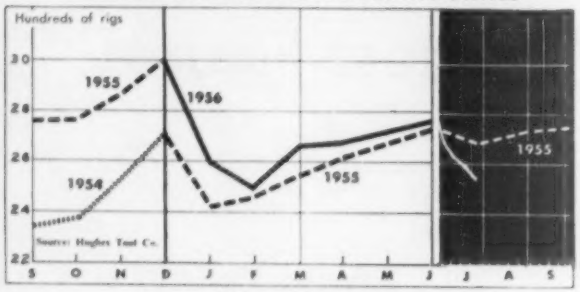
The difference between gasoline and distillate stocks was reduced 22,600,000 bbl. in May, 26,900,000 bbl. in June, and 29,400,000 bbl. in July. With gasoline still ahead of middle distillate by 32,600,000 bbl. at the end of July, there is little chance that the graph lines of these product stocks will cross in August.

The major product stock total is only 12,000,000 bbl. or 3.5 per cent larger than last year, but the balance between gasoline and distillate is very poor.

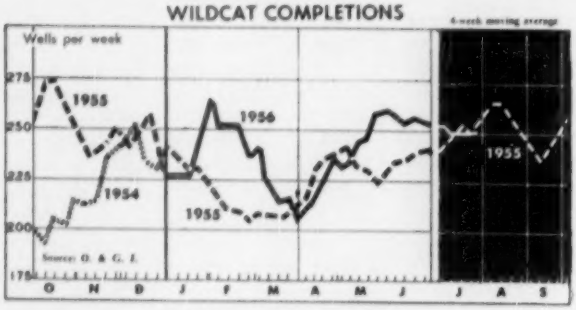
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	7-30-56	7-23-56	8-1-55
North Central and East	127	132	146
Southeast	35	33	26
Oklahoma, Kansas, Arkansas, Missouri	431	457	508
Louisiana	456	444	409
North and East Texas—Panhandle	357	373	386
Gulf and South Texas	258	266	236
West Texas-New Mexico	489	487	507
Rocky Mountain	279	266	319
Pacific Coast	104	123	144
Total United States	2,536	2,581	2,681
Western Canada	247	265	218

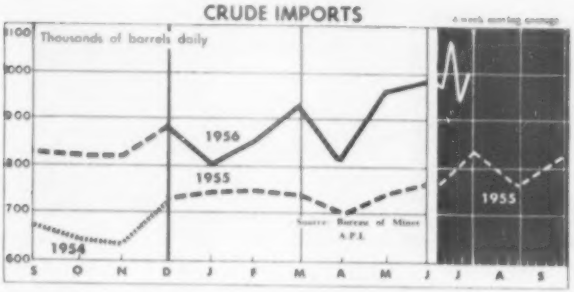
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS... WEEK ENDED JULY 28, 1956

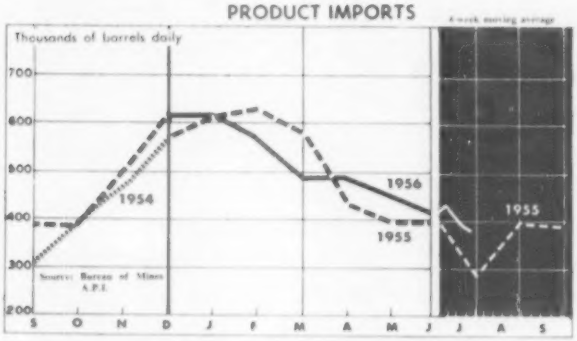
	Total of all wells							Wildcat completions and discoveries										
													Cumulative total, 1956					
	Comp.	Oil	Gas	Dry	Footage	1956 Cum.	1955 Cum.	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	3	1	0	2	19,441	63	48	0	0	0	2	2	0	0	1	29	30
Arkansas	9	6	0	3	28,554	449	427	1	0	0	1	2	24	0	3	78	105
California	49	41	1	7	246,646	1,261	1,458	2	0	1	7	10	31	0	4	243	278
Colorado	23	7	1	15	113,565	675	812	0	0	1	10	11	18	0	9	303	330
Illinois	107	48	2	57	228,274	2,167	2,182	1	0	0	28	29	31	0	1	390	422
Indiana	22	12	0	10	37,872	363	433	3	0	0	3	6	13	0	1	64	78
Kansas	101	46	14	41	324,714	2,952	2,907	0	0	3	16	19	75	2	19	524	620
Kentucky	54	23	3	28	81,757	1,002	755	0	0	0	13	13	26	0	1	204	231
Louisiana	77	42	14	21	403,636	2,230	2,286	3	0	4	9	16	70	32	40	293	435
North	51	35	5	11	148,274	921	1,206	1	0	1	5	7	18	1	2	116	137
South	21	5	7	9	204,604	1,050	1,080	2	0	2	4	8	41	28	26	157	252
Offshore	5	2	2	1	50,758	259	(*)	0	0	1	0	1	11	3	12	20	46
Michigan	6	3	0	3	14,637	260	288	0	0	0	3	3	5	0	0	87	92
Mississippi	7	1	0	6	49,300	254	275	1	0	0	5	6	10	1	1	106	118
Montana	14	6	0	8	64,928	214	179	1	0	0	6	7	10	0	0	60	70
Nebraska	9	3	0	6	49,890	586	441	1	0	0	4	5	25	0	0	260	285
New Mexico	29	11	14	4	119,731	1,085	924	0	0	0	3	3	31	0	6	97	134
Northwest	16	0	14	2	56,793	427	288	0	0	0	2	2	3	0	5	30	38
Southeast	13	11	0	2	62,938	658	636	0	0	0	1	1	28	0	1	67	96
North Dakota	7	4	0	3	49,615	140	134	0	0	0	3	3	7	0	0	33	40
Ohio	18	11	3	4	43,904	569	651	0	0	0	0	0	0	0	1	5	6
Oklahoma	159	87	8	64	575,576	4,951	5,045	5	0	0	10	15	75	16	26	408	525
Pennsylvania-New York	0	0	0	0	0	627	922	0	0	0	0	0	0	0	5	10	15
Texas	433	271	12	150	1,992,536	12,670	11,615	16	0	2	89	107	436	22	112	2,684	3,254
Southwest (1 & 4)	66	26	2	38	231,418	1,866	1,789	1	0	0	24	25	83	5	41	500	629
Gulf Coast (2 & 3)	46	17	6	23	407,004	1,527	1,477	2	0	2	17	21	42	11	39	404	496
East (5 & 6)	13	9	0	4	77,934	633	568	0	0	0	4	4	9	1	5	227	242
North Central (7-B & 9)	149	82	1	66	446,602	4,567	4,370	7	0	0	30	37	190	0	4	1,081	1,275
West (7-C & 8)	125	117	0	8	674,906	3,325	2,837	6	0	0	8	14	103	0	9	432	544
Panhandle (10)	34	20	3	11	154,672	752	574	0	0	0	6	6	9	5	14	40	68
Utah	0	0	0	0	0	72	45	0	0	0	0	0	2	0	2	38	42
West Virginia	12	2	9	1	32,151	366	344	0	0	0	0	0	0	0	6	7	13
Wyoming	22	7	2	13	102,784	459	456	0	0	1	7	8	9	0	7	112	128
Miscellaneous (Oregon)	1	0	0	1	2,000	64	19	0	0	0	1	1	4	0	0	52	56
Total United States	1,162	632	83	447	4,581,511	33,479	32,646	34	0	12	220	266	902	73	245	6,087	7,307
Total previous week	1,051	564	70	417	4,381,454			38	1	8	194	241	868	73	233	5,867	7,041
Total July 30, 1955	1,146	643	71	432	4,532,054			38	5	14	217	274	937	121	213	5,626	6,897
Cumulative 1956	33,479	18,360	2,239	12,880	135,799,791												
Western Canada	58	40	4	14	269,687	1,607											

*Included in South Louisiana.

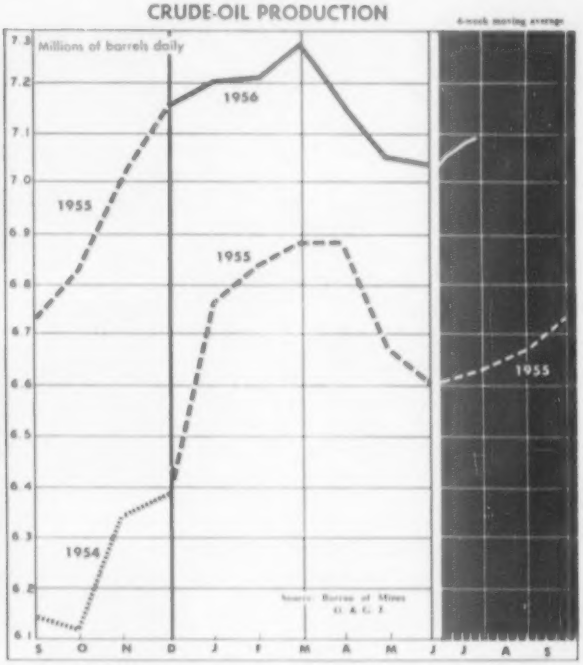
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

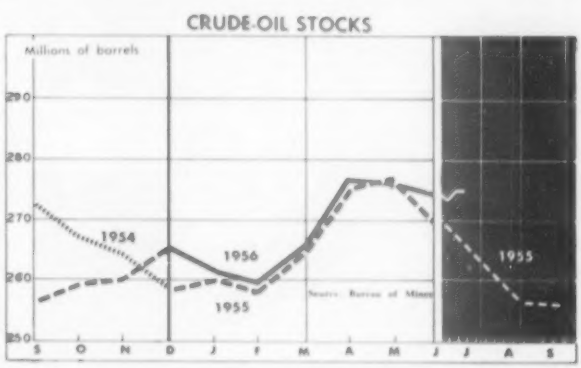


DAILY AVERAGE PRODUCTION FOR WEEK

	July 28, 1956			July 21
	Crude oil	Lease condensate	Total	Total
Alabama	7,500		7,500	6,500
Arkansas	75,750	450	76,200	76,600
California	960,400		960,400	961,100
Colorado	167,100		167,100	165,800
Eastern	50,600		50,600	50,100
Florida	1,325		1,325	1,325
Illinois	230,300		230,300	225,500
Indiana	31,500		31,500	31,100
Kansas	345,200		345,200	344,600
Kentucky	48,500		48,500	48,300
Louisiana	728,800	57,150	785,950	786,150
North	120,800	2,150	122,950	123,150
South	608,000	55,000	663,000	663,000
Michigan	27,800		27,800	29,200
Mississippi	107,300	4,350	111,650	111,650
Montana	63,300		63,300	62,700
Nebraska	38,600		38,600	37,300
New Mexico	233,100	4,325	237,425	237,525
North Dakota	37,200		37,200	37,800
Oklahoma	585,500		585,500	602,900
Texas	2,953,500	48,300	3,001,800	3,001,800
Dist. 1	55,000	425	56,425	56,425
Dist. 2	147,000	8,000	155,000	155,000
Dist. 3	434,000	22,500	456,500	456,500
Dist. 4	234,000	5,500	239,500	239,500
Dist. 5	44,000	375	44,375	44,375
Dist. 6	123,000	5,500	128,500	128,500
East Texas Field	210,500		210,500	210,500
Dist. 7-B	156,000	50	156,050	156,050
Dist. 7-C	182,000	3,800	185,800	185,800
Dist. 8	1,055,000	1,600	1,056,600	1,056,600
Dist. 9	215,000	400	215,400	215,400
Dist. 10	97,000	150	97,150	97,150
Utah	5,000		5,000	4,900
Wyoming	288,800		288,800	290,300
Others	‡300		‡300	200
Total U. S.	6,987,375	114,575	**7,101,950**	7,113,350
Change from previous week, down			**11,400**	
Canada	†441,000		†441,000	†467,000
Total U. S. production January 1-July 28			1,502,563,370 bbl.	
Same period last year (crude plus cond.)			*1,412,013,672 bbl.	

*Includes 23,530,175 bbl. condensate. †Week ended previous Monday. ‡Nevada 200, S. Dakota 100.

CRUDE-OIL STOCKS



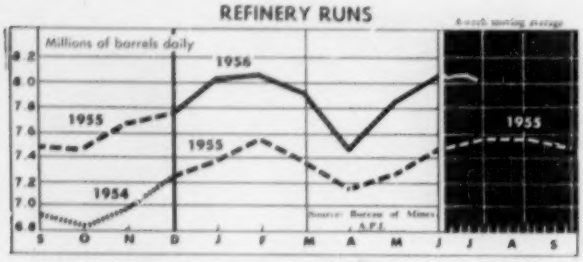
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

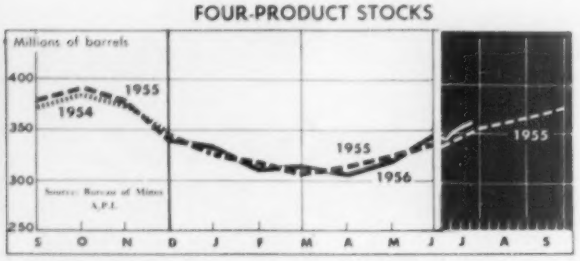
	7-21-56	7-14-56	7-23-55
Pennsylvania Grade	2,545	2,583	2,796
Other Appalachian	2,264	2,348	1,823
Illinois, Indiana, Michigan	10,491	10,849	10,872
Nebraska, North Dakota	2,572	2,280	1,863
Kansas	9,770	8,916	7,920
Oklahoma	27,248	27,208	22,332
Arkansas	2,900	3,051	2,656
Louisiana	15,289	15,623	17,186
North	2,618	2,660	2,621
South	12,671	12,963	14,565
Mississippi	2,897	3,044	3,068
New Mexico	8,087	8,314	8,521
Texas	121,960	119,923	128,601
East Texas proper	9,454	8,940	9,772
West Texas	59,414	58,350	59,418
Texas Gulf	22,047	21,488	25,484
Other Texas	31,045	31,145	33,927
Wyoming	19,592	19,637	14,765
Other Rocky Mountain	7,034	7,340	5,445
California	27,703	27,529	30,809
Foreign	†14,575	16,487	11,370
Total	274,927	275,132	270,027

*Bureau of Mines. †Includes 4,108,000 bbl. in California.

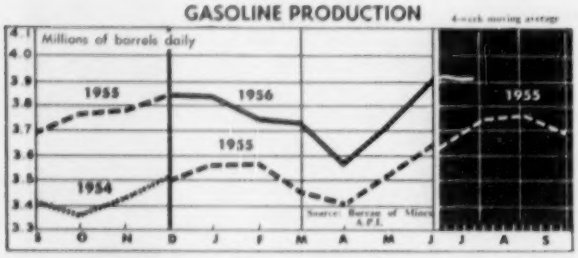
REFINERY RUNS



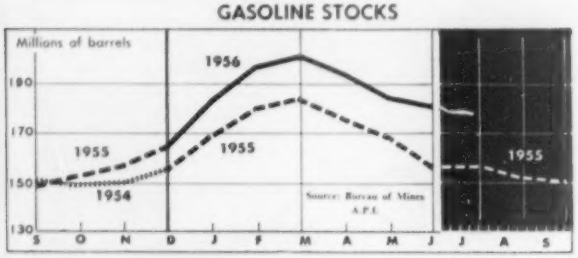
FOUR-PRODUCT STOCKS



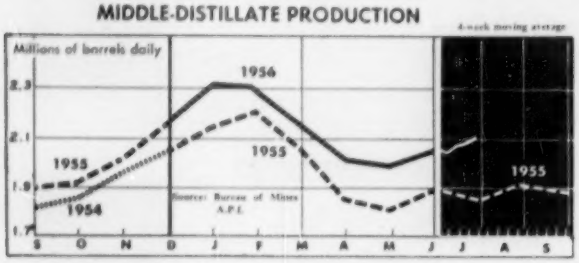
GASOLINE PRODUCTION



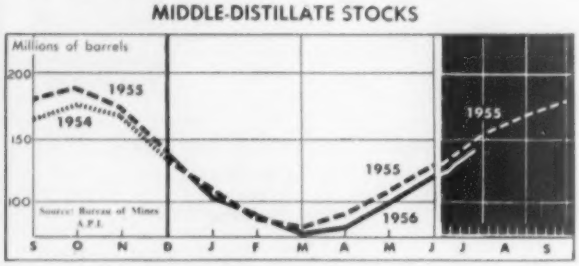
GASOLINE STOCKS



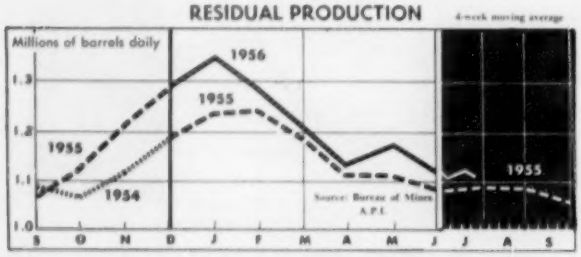
MIDDLE-DISTILLATE PRODUCTION



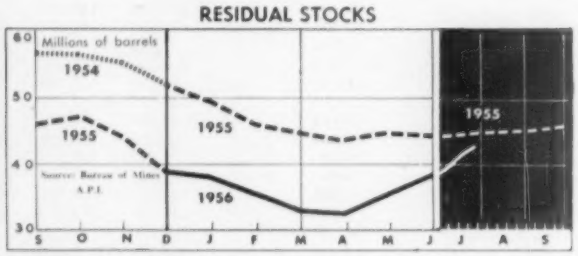
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, JULY 27

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, July 1955—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,162	516.2	31.0	332.3	196.4	40,396	10,829	37,006	11,216	1,101	450.2	24.0	267.6	195.7
Appalachian:														
District 1	110	42.1	4.9	24.0	7.2	4,718	470	2,337	486	101	40.9	4.1	24.6	4.0
District 2	86	56.7	4.9	11.3	15.0	2,853	824	804	452	100	55.5	2.1	11.7	13.6
Ind., Ill., Ky.	1,402	716.2	80.4	259.7	152.4	31,888	5,807	16,329	4,930	1,436	788.1	70.5	268.4	162.1
Minn., Wis., Dak.	93	46.0	4.3	25.1	5.9	6,956	1,108	6,035	244	(§)	(§)	(§)	(§)	(§)
Okla., Kans., Mo.	721	383.7	16.0	174.6	37.6	14,998	1,754	11,554	1,351	675	401.7	17.7	153.7	31.1
Inland Texas	284	182.6	10.0	52.2	25.4	6,995	457	1,834	1,495	252	173.4	6.7	47.8	22.6
Texas Gulf Coast	1,954	965.7	93.8	535.0	262.3	24,836	3,837	15,097	6,688	1,812	868.6	93.0	411.3	251.8
La. Gulf Coast	689	358.0	40.0	169.4	37.4	9,834	2,368	6,472	1,634	615	309.4	52.3	144.1	35.4
N. La. and Ark.	101	36.4	7.6	21.4	7.7	4,421	632	1,754	176	93	33.9	7.1	23.0	5.5
Rocky Mountain:														
New Mexico	22	11.7	0.3	3.6	2.4	400	8	94	21	23	11.7	0.2	4.0	3.4
Other Rocky Mtn.	281	128.7	2.3	66.3	31.9	6,409	389	2,747	917	275	125.1	5.4	58.7	34.1
West Coast	1,085	480.9	18.8	129.7	308.3	22,348	400	11,537	13,558	1,097	485.3	3.2	160.3	331.8
July 27, 1956	7,990	3,924.9	314.3	1,804.6	1,089.9	177,052	28,883	113,600	43,168	7,580	3,743.8	286.3	1,575.2	1,091.1
July 20, 1956	8,076	3,850.6	294.7	1,822.9	1,124.0	178,352	28,369¶	108,734	42,164					
July 29, 1955	7,577	3,778.1	316.7	1,572.6	1,112.9	157,005	32,000	115,936	45,457					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Included in Indiana, Illinois, and Kentucky. ¶Revised.

Crude-oil and refinery prices at representative U. S. and foreign points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	11.375-12.00
Premium (96 octane)	13.125-13.75
Gulf Coast (cargoes for coastwise or export movement):	
Regular (90 octane)	11.25-11.50
Regular (92 octane)	11.50-12.00
Premium (97 octane)	13.00-13.25
Premium (98 octane)	13.25-13.75
California—Los Angeles (rack):	
Regular (84 octane)	12.9-13.3
Premium (93 octane)	14.9-15.3
Caribbean area (cargoes):	
Regular (87 octane)	10.50
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.75-10.00
Diesel oil (58 d.i. and above)	9.625-9.875
Distillate No. 1	9.625-9.875
Distillate No. 2	8.75-9.00
Gulf Coast (cargoes):	
★ Kerosine 41-43	9.125
★ Distillate No. 2	8.50
New York Harbor (barges):	
Kerosine 41-43	10.85
Distillate No. 2	10.35
Diesel fuel, 48-52 d.i.	10.65
Caribbean area (cargoes):	
Distillate No. 2	8.50

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.00-2.10
Gulf Coast (cargoes):	
Bunker C fuel	$2.10
New York Harbor (barges):	
Bunker C fuel	$2.80
Caribbean (cargoes):	
Bunker C at Aruba, N.W.I.	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.15-2.25

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	26
200 vis. neutral (180 at 100°), 25 p.t.	23

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.02				
15-15.9	2.08				
16-16.9	2.13				
17-17.9	2.19				
18-18.9	2.24				
19-19.9	2.30				
20-20.9	2.35	$2.50		$2.37	
21-21.9	2.41	2.52		2.39	
22-22.9	2.47	2.54		2.41	
23-23.9	2.52	2.56		2.43	
24-24.9	2.58	2.58	$3.01	2.45	
25-25.9	2.64	2.60	3.03	2.47	$2.13
26-26.9	2.69	2.62	3.05	2.49	2.19
27-27.9	2.76	2.64	3.07	2.51	2.24
28-28.9	2.83	2.66	3.09	2.53	2.29
29-29.9	2.91	2.68	3.11	2.55	2.34
30-30.9	2.97	2.70	3.13	2.57	2.39
31-31.9	3.04	2.72		2.59	2.44
32-32.9	3.12	2.74		2.61	2.48
33-33.9	3.20	2.76		2.63	2.52
34-34.9	3.27	2.78		2.65	2.56
35-35.9	3.34	2.80		2.67	2.60
36-36.9	3.39	2.82		2.69	2.64
37-37.9		2.84		2.71	2.66
38-38.9		2.86		2.73	2.68
39-39.9		2.88		2.75	2.70
40 and up		2.90		2.77	2.72

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas. †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, February 7, 1956; east of California, June 15, 1953; Pennsylvania Grade, July 16, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.57
Middle District	4.44
Southwest Pennsylvania	4.15
West Virginia	4.03
Buckeye Grade	3.97
Zanesville Grade	3.15
Illinois Basin	2.90
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.8°, Tucupido	*3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	*2.80
Tia Juana medium, 26.5°-26.9°, Amuay§	†2.30
Quiriquire, 16.5°-16.9°, Caripito	†2.21
Lagunillas heavy, flat, Amuay or Las Piedras§	2.05
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	‡1.90

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.46
Iraq, 36.0°-36.9°, Tripoli, Banias	2.46
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

Gulf-U.S.N.H., clean (USMC+70%)	$4.86
Gulf-U.S.N.H., dirty (USMC+42.5%)	4.08
N.W.I.-U.S.N.H., dirty (USMC+32.5%)	3.58
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PIPE—3700' 7" 20# seamless 8r r2. 9000' 3½" 7.70# API T&C like new, 5½" and 7" lapweld all located Tulsa, Oklahoma. Edco Pipe & Supply Co., Box 151, Tulsa, phone GI 7-5970.

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1—24-L BUCYRUS-ERIE Spudder mounted on 6x6 GMC truck. Junk rack, light plant, good wire lines and tailing in tools for 6 inch and 7 inch hole. Casing tackle strut on mast. Machine in condition. Gaines Drilling Company, P. O. Box 547, El Dorado, Kansas, Telephone 2317.

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Aluminum Line Pipe, 26,600' of 6⅝" O.D. 2.80 Wall, 6.556#, 40' lengths, located Magnolia, Arkansas. Also have large stock New & Used Casing, Tubing, Surface Pipe & Line Pipe.

Sabine Pipe & Supply Co.
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COMPRESSOR BUILDING — Structural steel, 12' x 35' x 120. Boswell-Frates Company 1003 Kennedy Building, Tulsa, Oklahoma

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1—800# 20 MMCF Absorber with Scrubber etc
1—6 Cyl. Buda Engine, 243 H.P. at 900 RPM with Starting Engine.
1—Fluor "Counterflo" induced Draft Cooling Tower Complete.
2—20 MMCF LTX Units.
Vessels, Generators, Pumps, Instruments, Pipe, Valves, and Fittings and Other Equipment necessary in Gasoline Plant Construction. Detailed Inventory Available upon request.

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20—Brown fintube exchangers, 600# 140 sq. ft. 4-6 chrome.
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2—Convection furnaces, 20 MIL BTU/hr.
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8—Hi-vol pumps, 10 x 7 x 18, 10 x 8 x 12, 6 x 4 x 12, 6 x 3 x 8.
30—Duplex piston pumps, all sizes.
1—10' x 30' asphalt still.
6—Steel Bldgs., 20 x 150, 20 x 20, 20 x 40.
1—BS&B Oil and gas separator, 10.7 mcf, 3500 BBl./day.
Large Selection of Series 15, 30 Steel Valves, 1" to 8".
Approximately 15,000 ft. Schedule 40, 80 pipe, 2" to 8".

TOWERS & VESSELS

8' x 75' 25 tray 40#
2' x 43' 30 tray 250#
13" x 35' 30 tray 500#
3—8½' x 25' hor tanks 50# WP.

COMPRESSORS

2 Worth LTC-6 800 hp.
1 Worth LTC-3 400 hp.
3 Penn Comps 100 CFM 500 lbs. 385 CFM 160 lbs.

MISCELLANEOUS

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30—304 SS shell & tube condensers 100-1000 sq. ft.
Lab Petro-Chem furnace 50,000 BTU/hr.
800 ft. of 2" 4-6 ch pipe
Large quantity of 410 SS chrome strips and sheets.
Tremendous selection stainless steel and steel valves ½"-6".
BJ hot oil pump 3 x 9, 13 st, 325 gpm, 4600' hd.
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Rig A—Located near Lovington, New Mexico.
National 100 Drawworks, 3—6G-500 Superior Engines, National 7¾" x 18" and Gardner-Denver 7½" x 14" Pumps, 136' Lee C. Moore Mast on 8' Substructure, 10¾" Shaffer Double Cellar Control Gate, 13,500' 4" OD Grade E Drill Pipe and 26 Drill Collars.

Rig B—Located near Andrews, Texas.
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Rig C—Located near Andrews, Texas.
Unit Rig U-15 Drawworks, 3—Waukesha NKU Engines, National C-250 Pump, 127' Lee C. Moore Mast on 7' Substructure, 10¾" Shaffer Double Cellar Control Gate, 5,700' 3½" Grade E Drill Pipe and 26 Drill Collars.

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All equipment must be removed in 90 days

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2'x38' 16 trays, 250 PSI.
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10 MILLION BTU/HR.—NEW 1938-40

18'x20'x13' Oil/Gas Burners chrome tubes.
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6—Adm. Tube Multi-Pass 141-440 sq. ft.
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4250 gal. Tank with pumps, scale, dye pot, all valves, fittings, pipe.

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1—250 HP B. & W. Stirling W.T. 150 PSI.
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2—Steel Sectional Stacks 4'x135'.

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SIMPLEX	DUPLEX
12x5½x12	10x7x12
6x6x12	7½x6x10
6x5x12 (2)	7½x5¾x6
6x3x8	6x5¾x6 (4)
4½x2x6	6x4x6 (4)
	4½x3x4 (7)

CENTRIFUGAL M.D.

8" Worth. (2) 3" Gould (2) 2" Worth. (4) 1¼ Amer. Marsh

FURNACE TUBING—NEW

1025' 4-6% chrome 3" OD x ¼" wall

TANKS—WELDED

15,000 gal. 10'8"x23' vert. & hor. (4).
9,000 gal. 7'x30' hor. (2)
5,000 gal. 5'x35' hor. & vert. (3).
16 Tanks from 200 to 1500 gal.

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75,000 lb./hr. 400 PSI Combustion Engr.
304 HP 125 PSI firetube
100 HP 300 PSI oil fired.
50 HP 150 PSI oil fired.

STEEL BUILDINGS

25'x90', 40'x40', 42'x56', 42'x155'.

GAS COMPRESSORS

I.R. Type ER, 7x20, 14x20, 14&7x20.

PUMPS

5"x12" Hot Oil, Worth. Duplex w/120 HP Diesel Engine.
NEW National Transit Steam, 6"x6"x18", 6"x5"x12", 10"x6"x12", 5½"x3¾"x5".

TANKS

12,500 bbl. welded 48'x39'.
1,500 bbl. bolted, vert. (2).
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12,000 gal. 8'x30' hor., rivet. (11).
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TURBO GENERATOR SET—5000 KVA. WEST.

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20,000 ft. New 4½" O.D.—10.8 lbs.
Standard in Single R.L. Plain End
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Immediate shipment from warehouse stock at special reduced price. Subject to prior sale.

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NEW ARMCO SPIRAL WELDED PIPE

IN STOCK F.O.B. TULSA

Quantity	Size	Wall Thickness	Press. Test lbs./sq. in.
1400'	6⅝" O.D.	.141	1190
1740'	6⅝" O.D.	.172	1450
320'	6⅝" O.D.	.188	1590
30'	6⅝" O.D.	.219	1850
30'	6⅝" O.D.	.280	1950
200'	8⅝" O.D.	.109	710
790'	8⅝" O.D.	.134	870
1000'	8⅝" O.D.	.141	910
1020'	8⅝" O.D.	.172	1120
1110'	8⅝" O.D.	.188	1220
60'	8⅝" O.D.	.250	1620
700'	10¾" O.D.	.109	570
450'	10¾" O.D.	.141	740
270'	10¾" O.D.	.172	900
520'	12¾" O.D.	.109	480
900'	12¾" O.D.	.141	920
280'	14" O.D.	.188	750
20'	14" O.D.	.219	880
20'	14" O.D.	.250	1000
20'	16" O.D.	.141	490
40'	16" O.D.	.172	600
1200'	16" O.D.	.188	660
10'	16" O.D.	.219	770
20'	16" O.D.	.250	880
20'	18" O.D.	.172	540
260'	18" O.D.	.188	580
144'	18" O.D.	.250	780
20'	20" O.D.	.188	530
11'	20" O.D.	.250	700
50'	24" O.D.	.188	440
240'	24" O.D.	.219	510
60'	24" O.D.	.250	580

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FOR SALE at our Tallant Chemical Plant —One steel smoke stack 3'8" x 100' high with rectangular base ⅜" steel. Lowered ready for truck movement. $500.00. Cities Service Oil Company, Bartlesville, Oklahoma. H. D. Patridge.

1 BUCYRUS 22 mounted on 6x6 truck. 1 6x6 GMC truck water tank. Rig has been used for setting surface pipe. Fully equipped and ready to go to work. Gaines Drilling Company, P. O. Box 547, El Dorado, Kansas. Telephone 2317.

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AT-3427—Houston, Texas

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FOR SALE—Core Analysis Laboratory. Complete with Electric Retorts. Contact Chapman Pipe & Supply, ME 7-2493, Oklahoma City.

GAS COMPRESSORS—3 Bessemer type 10 twins direct connected units—Boswell-Frates Company, 1003 Kennedy Building, Tulsa, Oklahoma.

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A-126 EMSCO MAST, 340,000 lb. Capacity, 126 ft. high, 8 ft. high x 43 ft. long substructure, complete stairs and flooring. $12,500. Stored at Lafayette, Louisiana. Norvell-Wilder Supply Company, Box 2178, Houston, Texas. Phone CA 8-3471.

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Scrubbers, accumulators, tanks, absorbers, pumps, valves, reboilers, exchangers, etc.

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PIPELINE ENGINEER-ECONOMIST degree, registered professional status, fifteen years experience in design, operation, and economics of oil, natural gas, and products pipeline systems and associated facilities. Seeking permanent position with newly organized or operating company. Available January, 1957. Salary range $12,000 yearly. Box J-649, The Oil and Gas Journal, Tulsa, Oklahoma.

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IMMEDIATE DELIVERY
OIL COUNTRY GOODS

35,000'	5½" OD 13#	E.W.	RANGE 2	8 RD. THRD.
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50,000'	6⅝" OD 18#	E.W.	RANGE 3	8 RD. THRD.
25,000'	7" OD 20-23-26#	SMLS.	RANGE 2-3	8 RD. THRD.
1,500'	9⅝" OD 32-30#	SMLS.	RANGE 2	8 RD. THRD.
8,000'	9⅝" OD 40#		RANGE 2-3	8 RD. THRD.
60,000'	2⅜" OD EUE TUBING	E.W.	RANGE 2	8 RD. THRD.
30,000'	2⅜" OD EUE TUBING	SMLS.	RANGE 2	8 RD. THRD.
25,000'	2⅞" OD EUE TUBING	SMLS.	RANGE 2	8 RD. THRD.

Other items line pipe, casing and tubing available, contact.

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Climax-Brundred Waterflood Division
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NOWATA, OKLAHOMA

A complete gas system, serving company properties located southeast of Nowata, Oklahoma, in Nowata County and extending into Rogers County, is ready to be abandoned. Sealed bids covering the following footages of secondhand pipe will be opened at 12 noon, September 1, 1956, at the above address.

Size	Type of Pipe	Footage
1.9" O.D.	Line Pipe T&C	3,935'
2⅜" O.D.	Line Pipe T&C	47,098'
2⅞" O.D.	Line Pipe PE & T&C	8,872'
3½" O.D.	Line Pipe PE & T&C	7,108'
4" O.D.	Boiler Flues PE	48,803'
5" O.D.	Boiler Flues PE	2,783'
5⅜" O.D.	Boiler Flues PE	23,152'
5½" O.D.	Casing PE	2,441'
6" O.D.	Principally Boiler Flues PE	27,341'
6⅝" O.D.	(6¼" Casing) PE	43,299'
7" O.D.	(6⅝" Casing) PE	4,989'

All footages have been measured and are believed to be accurate. Very little pipe is buried.

A single bid covering the entire system will be accepted only on a where-is, as-is, basis and will be sold to the highest bidder. However, the company reserves the right to reject any and all bids. Financial responsibility will be taken into consideration and terms can be arranged. Successful bidder will be notified on or before September 10, 1956.

Pipe may be inspected at any time by contacting

M. L. Hagan, General Superintendent,

at Nowata Camp Site, telephone—Nowata Oklahoma 202

MECHANICAL ENGINEER

Graduate Mechanical Engineer with minimum of two years experience in oil refinery engineering. He will report directly to the Senior Design Engineer and be responsible for mechanical designs and cost estimates of refinery processing equipment.

Duties will be closely integrated with operations of new independent refinery which includes crude distillation, catalytic cracking, polymerization, coking and utilities.

Send complete resume of education and experience, including salary requirements. All replies confidential.

Great Northern Oil Company

P. O. Box 3596
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HELP WANTED

PRODUCTION MAN, must have at least 10 years experience in completion and workover. For Southern Oklahoma. Give background, reference, and salary expected. Independent. Box J-647, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

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Immediate opening with good growth potential for Organic Chemist or Chemical Engineer in the development of chemicals for the Petroleum Industry. M.S. or Ph.D. with 3 - 5 years experience preferred. Position is in the Houston, Texas vicinity.

Send resumé and salary requirements to:

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For responsible staff position in old established company, building engines for oil field service. Must be capable of handling and supervising design work, field and laboratory experimentation, and acting as liaison between plant departments and sales/service division.

Send complete resumé of education, personal data, work experience and references. Interviews will be arranged for qualified candidates and all replies will be kept confidential.

Address Reply To
BOX J-651,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

PLANT ENGINEERS (Natural Gasoline)

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WARREN PETROLEUM CORPORATION
BOX 1589
TULSA 2, OKLAHOMA
ATTENTION: R. L. LANE OR C. C. McKEE.

OIL PRODUCTION SUPERVISORS

(Ages 28 - 38)

A major integrated U. S. oil company operating in South America has career opportunities in a rapidly expanding organization for qualified oil production supervisors in production work including (1) well repair, cleanout and workover (2) supervision of 150-200 natural-flow and pumping wells and the gathering and producing facilities of approximately 200,000 B/D of crude oil (3) supervision of pipelaying barge in laying and repairing of off-shore gathering lines. Engineering graduates preferred; high school minimum acceptable education. Candidates must have had a minimum of 6 - 8 years of diversified and progressively responsible oil field production experience. Salary including bonus approximately $14,000 - $16,000 depending on qualifications and experience. Liberal employee benefits including home vacations with travel expenses. Send complete resume of personal data and work experience. Replies held in strict confidence.

Box 480, Dept. Y-21
New York 19, N. Y.

RESERVOIR ENGINEER

Completely integrated and independent petroleum company is now expanding its production and exploration activities, and at the same time acquiring producing properties by purchase. Company now needs a Petroleum Engineer experienced in reservoir and evaluation appraisal work. Permanent position with aggressive Independent operating in Texas, New Mexico and Rocky Mountain States. Written replies should furnish details on education, experience, age, references, and suggested salary.

Box J-628,
The Oil and Gas Journal,
Tulsa, Oklahoma.

PETROLEUM ENGINEERS

Graduate Petroleum Engineer with three to five years experience wanted by large independent oil company for work in South Texas. In first reply give resume of experience, date available, and salary expected.

Box J-642, The Oil and Gas Journal,
Tulsa, Oklahoma.

DRILLING ENGINEERS

(Ages 25 - 35)

A major integrated U. S. oil company operating in South America has career employment opportunities in a rapidly expanding organization for qualified drilling engineers with 4½ to 8 years of experience in the drilling phase of the oil industry. Candidates must be graduate engineers preferably with a mechanical or petroleum engineering degree. Salary including bonus of approximately $14,000 - $15,800 depending on qualifications and experience. Liberal employee benefits including home vacations with travel expenses. Send complete personal data and work experience resume. Replies will be held in strict confidence. Interviews will be arranged for qualified candidates.

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Assistant General Superintendent for small progressive Petro Chemical Plant located on Gulf Coast. Requirements: B.Ch.E. Degree Minimum 8-10 years diversified experience.

CHIEF CHEMIST:

Requirements: B.Ch.E. Degree.
Minimum of 3-5 years experience including laboratory and process engineering work. Ability to instigate and supervise research work.

Applicants write giving qualifications and minimum salary requirements to:

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HELP WANTED

HELP WANTED

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located in

SOUTH AMERICA

Have staff positions now open for:

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Assignments may include project development, cost estimation, materials specifications, design & drafting, and construction follow-up.

PROCESS ENGINEER:
Work assignments may involve process design and control, economic studies and/or scheduling of refinery operating programs.

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Will plan and coordinate work of refinery mechanical forces or coordinate data required to plan major refinery turnarounds.

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PETROLEUM ENGINEERS:
Assignment will be of general Petroleum Engineering nature. Emphasis will be placed on cost and engineering analysis.

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Will conduct various project assignments including transmission, distribution, control, lighting, communications systems.

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Radio City Station
New York 19, New York

OIL INDUSTRY Employment Service, 405 Tuloma Bldg., Tulsa, Okla. Tom Robinson, owner. Send brief resume education, experience, age, family status.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

SALES ENGINEER For California Oil Fields. Must have wide experience in selling, servicing, engineering and supervision of the installation of equipment for the treating, dehydrating, separating and handling of petroleum production. Chemical or petroleum production engineer preferred. Offshore production equipment experience helpful. Give complete details in first letter and salary requirements. Box J-650, The Oil and Gas Journal, Tulsa, Oklahoma.

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To assist in supervising office & field and domestic & foreign activities of the Operating Department.

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ASSISTANT Refinery Superintendent; independent producer-refiner in Mid-Continent area has opening for man with broad experience in supervision of distillation units, treating, blending, etc.; plant located in a small town with a company which has a record of 25 years successful operation. Box J-652, The Oil and Gas Journal, Tulsa, Oklahoma.

GAS PIPELINE ENGINEER—Graduate, qualified for registration or registered Mechanical, Civil, or Petroleum background. Immediate opening, experienced in construction, pipeline and compressor station design, and in pipeline economics and operations. Salary commensurate with experience and qualifications. Send resume with application. Chief Engineer, Mississippi River Fuel Corp., 407 N. 8th St., St. Louis 1, Mo.

WANTED, PETROLEUM ENGINEER: Expanding independent oil company has opening for petroleum engineer with three to six years experience to be located in Wichita and central Kansas. Write Production Department, Box 1030, Wichita, Kansas giving qualifications. Our employees know of this ad.

SITUATIONS WANTED

EXECUTIVE GEOLOGIST, legal background, experienced in production, exploration, economic evaluation, reservoir and subsurface research. Qualified for varied phases of oil industry and can furnish sizeable exploratory program to proper individual or group. Desire top echelon position with opportunity, if possible, to purchase corporate stock. Box J-666, The Oil and Gas Journal, Tulsa, Oklahoma.

EXECUTIVE, legal, tax, corporation organization and management experience, experienced in all phases exploration, production and marketing, desires connection with producing and exploring company Rocky Mountains or West Coast Areas. Box J-665, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING SUPT., Administrative background, 25 years experience in South America and Mexico, capable of assuming full charge of project. Single status, desires foreign employment. Box J-626, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGIST: 31, Ph.D., 7 years excellent experience in North and South America. Capable of directing oil exploration, evaluation and development. Prefer independent with forward-looking program in North or South America. Box J-660, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION FOREMAN: Married, with family, age 29. Best of references. Box J-657, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES REPRESENTATIVE—Ten years supply store manager, eight years production, Business Degree TCU. Prefer Texas Gulf Coast or East Texas. Write Box 825, Denver City, Texas.

RESERVOIR ENGINEER Geologist with management experience, who has had 14 years experience with major and large independent desires position as reservoir or valuation engineer that involves responsibility and offers future; 36 years of age, married, with two children. Location U. S. Available immediately. Full references. Box J-667, The Oil and Gas Journal, Tulsa, Oklahoma.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited.

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FOR SALE: 80, 160, 640 acre oil lease, rich Barton Co., Kansas oil area. Production one mile. East half Sec. 10, South half Sec. 11, 17, 15. Roy Austin, Kremmling, Colo.

FOR SALE: Producing oil and gas wells and leases located in Garvin, Stephens, Kiowa Counties, Oklahoma. For details call or write, Ralph W. Shebester, Box 337, Pauls Valley, Oklahoma. Telephone 570.

FOR SALE: ⅛ of ⅞ working interest two wells sand production NE NE Section 19-4S-11E, White County, Illinois. B. L. Rucker, Telephone: 1072, Mt. Vernon, Illinois.

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$40,000,000 TO INVEST in oil production, any part over $1,000,000, give full report. Tjaden, Eagle Lake, Texas.

BUSINESS OPPORTUNITIES

HAVE CAPITAL available to develop oil properties for participating interest. Box J-512, The Oil and Gas Journal, Tulsa, Oklahoma.

ESTABLISHED OIL OPERATORS desire contact with investment firms or individuals willing to invest a minimum of $25,000.00 on a well planned exploration program in Illinois Basin. P. O. Box 733, Evansville, Indiana.

CAPITAL CONTACT. Will consider placing proposition requiring corporate financing on Underwriting basis. Confidential. Write Consultant, 817 51st St., Brooklyn, N. Y.

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OPPORTUNITY TO BUY COMPANY MANUFACTURING UNIQUE AND REVOLUTIONARY OIL WELL EQUIPMENT.

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Box J-614, The Oil and Gas Journal,
Tulsa, Oklahoma,
for complete information.

WANTED
CASINGHEAD GAS

Independent group is interested in purchasing one to three million cubic feet per day of casinghead or flare gas for compressor and/or plant processing facilities.

Resources, equipment and personnel available to undertake project immediately on proof of satisfactory reserves.

Would consider some partnership or joint owner arrangement. Might also consider purchase of operating property.

Prefer Southern Oklahoma, Texas or Louisiana properties.

BOX J-854,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR. Bureau of Land Management, Washington, D. C. By virtue of the authority vested in the President and pursuant to Executive Order No. 10355 of May 26, 1952, and Public Land Order 1298 of May 4, 1956, notice is hereby given that 492.51 acres of land including parts of Secs. 3 and 12 in the University Leagues Subdivision, Blocks 1, 11, 15, and 16, in Grayson County, Texas, situated within the Perrin Air Force Base, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.D.T., on August 29, 1956. Details of the lease offer, copies of the lease agreement with plat of lease area and special stipulations as to use and protection of the property and drilling requirements and bid forms may be obtained from the Oil and Gas Supervisors of the Geological Survey at 239 Federal Building, Tulsa, Oklahoma, and at 333 St. Charles Avenue, New Orleans 12, Louisiana; the Commander of the Perrin Air Force Base, Sherman, Texas; or the Washington office of the Bureau of Land Management, or the Land Office at Santa Fe, New Mexico. L. E. Hoffman, Minerals Staff Officer.

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VENEZUELAN OIL SCOUTING AGENCY. Periodic reports—maps—newsletter. Mail: VOSA Apartado 3963, Caracas. Cables: VOSA, Caracas. Telephone 544802. Neal VanMiddlesworth.

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Sealed bids will be received until 2:00 P. M. Monday, August 13, 1956, and opened at that time at the Pawnee Area Field Office, Pawnee, Oklahoma, for the leasing of allotted lands located in Kay, Noble and Pawnee Counties, Oklahoma, for oil and gas mining purposes. For additional information write or telephone Mr. John L. Johnson, Area Field Representative of the Pawnee Area Field Office (Phone 985).

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ACF Industries, Incorporated, Valve Division 115
Allis-Chalmers, Power Equipment Division 32
Allpax Company, The 160
American Iron & Machine Works Co. Back Cover
Armstrong Machine Works 20
Baird Mfg. Co. 130
Baker Oil Tools, Inc. 103
Bell Aircraft Corp. 128
Bethlehem Steel Co. 23, 44
Bos-co Equip't Eng'r'g & Mfg. 116
Butler Manufacturing Company 113
Byron Jackson Tools, Inc. 63
Cable Engineering 164
Caran Engineering Corporation 130
Chase Brass & Copper Co. 92
Chicago Bridge & Iron Company 61
Classified Advertising 176, 177, 178, 179, 180
Coates Field Service, Inc. 116
Continental Electric Motors 117
Continental Supply Co., The 135
Crose Manufacturing Co., Inc., M. J. 126
Dowell Incorporated 48, 125
Drilling & Service, Inc. 153
Drilling Equipment Mfg. Co. (DEMCO) 158
Drilling Specialties Co. 142
du Pont 5
Edward Valves, Inc. 129
Electro Rust-Proofing Corporation 136
Emsco Manufacturing Company D+B Division 135
Enardo Manufacturing Company 42
Fabri-Valve Company of America 117
Fairbanks, Morse & Co. 4
First National Bank & Trust Co. of Tulsa, The 122
Foster Wheeler Corporation 12
Garlock Packing Company, The 119
Gaso Pump & Burner Mfg. Co. 8
General American Transportation Corporation 65
General Electric Co., Electronic Dept. 102
Globe Oil Tools Company 111
Goodyear Tire & Rubber Company, The 11
Goulds Pumps, Inc. 121
Grancell, I. H. 129
Graver Tank & Mfg. Co., Inc. 43
Grinnell Company, Inc. 9
Grove Valve and Regulator Company 94
Guiberson Corporation 166
Gustafson Mfg. Co., Inc. 117
Halliburton Oil Well Cementing Co. 15, 162, 163
Hazard Wire Rope Division of American Chain & Cable Co., Inc. 35
Higgins, Inc. 157
Hudson Engineering Corporation 91
Huey & Co., B. E. 116
Hughes Tool Co. 73, 74
Ingersoll-Rand 15
Jenkins Bros. 16
Jones & Laughlin Steel Corporation Supply Division 14
Kennedy & Mattison Company 33
Kidde & Company, Inc., Walter 27
Kobe 149
Le Roi Division of Westinghouse Air Brake Co. 18
Linde Air Products Company, A Division of Union Carbide and Carbon Corp. 28
M & V Tank Company 120
Mack Trucks, Inc. 26
Maintenance Engineering Corporation 118
Maloney-Crawford Tank & Mfg. Co. 17
Mayo Hotel, The 127
McDonald Company, B. F. 120
McDonough Marine Service 164
Midwestern Pipe Line Products Co. 118
Mission Mfg. Company Inside Back Cover
Moore Corporation, Lee C. 155
Oil Base, Inc. 159
Oil Well Supply Division 6
Onan & Sons, Inc., D. W. 157
Orbit Valve Company 107
Osborn Manufacturing Company, The 137
Otis Pressure Controls, Inc. 146, 147
Paris Distributor, Inc., Henry H. 165
Parkersburg Rig & Reel Co. 40
Partlow Corp., The 121
Peerless Supply Co., Inc. 130
Penn Controls, Inc. 41
Petreco, A Division of Petrolite Corporation 39
Petroleum Distributing Co. 38
Pittsburgh Plate Glass Company 123
Plomb Tool Company 38
Products Research Service, Inc. 13
Proto Tool 38
Refinery Supply Co., The 127
Republic Steel Corporation 30, 31
Reynolds Metals Company 36, 37
Shell Oil Company 25
Southern Mapping and Engineering Company 116
Southern Mill & Mfg. Co. 124
Southwest Industries, Inc. 139
Templeton, Kenly & Co. 130
Thomas Flexible Coupling Co. 114
Tretolite Company, A Division of Petrolite Corporation 10
Union Carbide and Carbon Corporation, Linde Air Products Company 28
United States Steel Corporation—Oil Well Supply Division 6
United States Treasury Dept. 170
United Supply & Manufacturing Co. 99
Viking Pump Co. 160
Vogt Machine Co., Henry 34
Walker Co., W. L. 116
Wallace & Tiernan, Inc. 136
Walworth Co. 7
Warren Petroleum Corporation 46
Web Wilson Oil Tools 21, 22
Well Equipment Mfg. Corp. 138
Western Company 150, 151
Wheland Company, The 24
Wilkening Manufacturing Co. 29
W-K-M Manufacturing Company, Inc., A Subsidiary of ACF Industries Incorporated 115
Wyatt Metal & Boiler Works Inside Front Cover

Mid-Continent Supply Company gives faster service—and improves efficiency—with expanded General Electric two-way radio system

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DOWN-TIME on an oil rig costs big money. To keep operating, oil men depend on the fast-moving parts and supply services provided by Mid-Continent. In turn, Mid-Continent relies on a recently expanded General Electric two-way radio network to maintain contact with field men working the oil field sites. Supply and service vehicles, equipped with mobile radio, speed customer service by cutting time and mileage delays.

Radio Now Serves Mid-Continent In Five States

Mid-Continent now operates 18 narrow-band G-E transmitters, feeding signals to 89 mobile units in a five-state area. Stores in Texas, Oklahoma, New Mexico, and parts of Colorado and Nebraska are in constant contact with their field men. An emergency repair call relayed to a mobile unit sends a man, or a part, on the way to the job site in a matter of minutes.

New General Electric Progress Line Radio

New Progress Line radios offer complete plug-in chassis design, chassis interchangeability, and they operate on 6 or 12 volt power. Only General Electric mobile radios feature the new 6600 series tubes—manufactured and pre-tested for absolute dependability in 2-way radio circuits. Ask your G-E Communications Counselor for the full details, or, write: *General Electric Company, Communication Equipment, Section X886-6, Electronics Park, Syracuse, New York.* In Canada, write: *C.G.E. Electronics, 830 Lansdowne Avenue, Toronto.*

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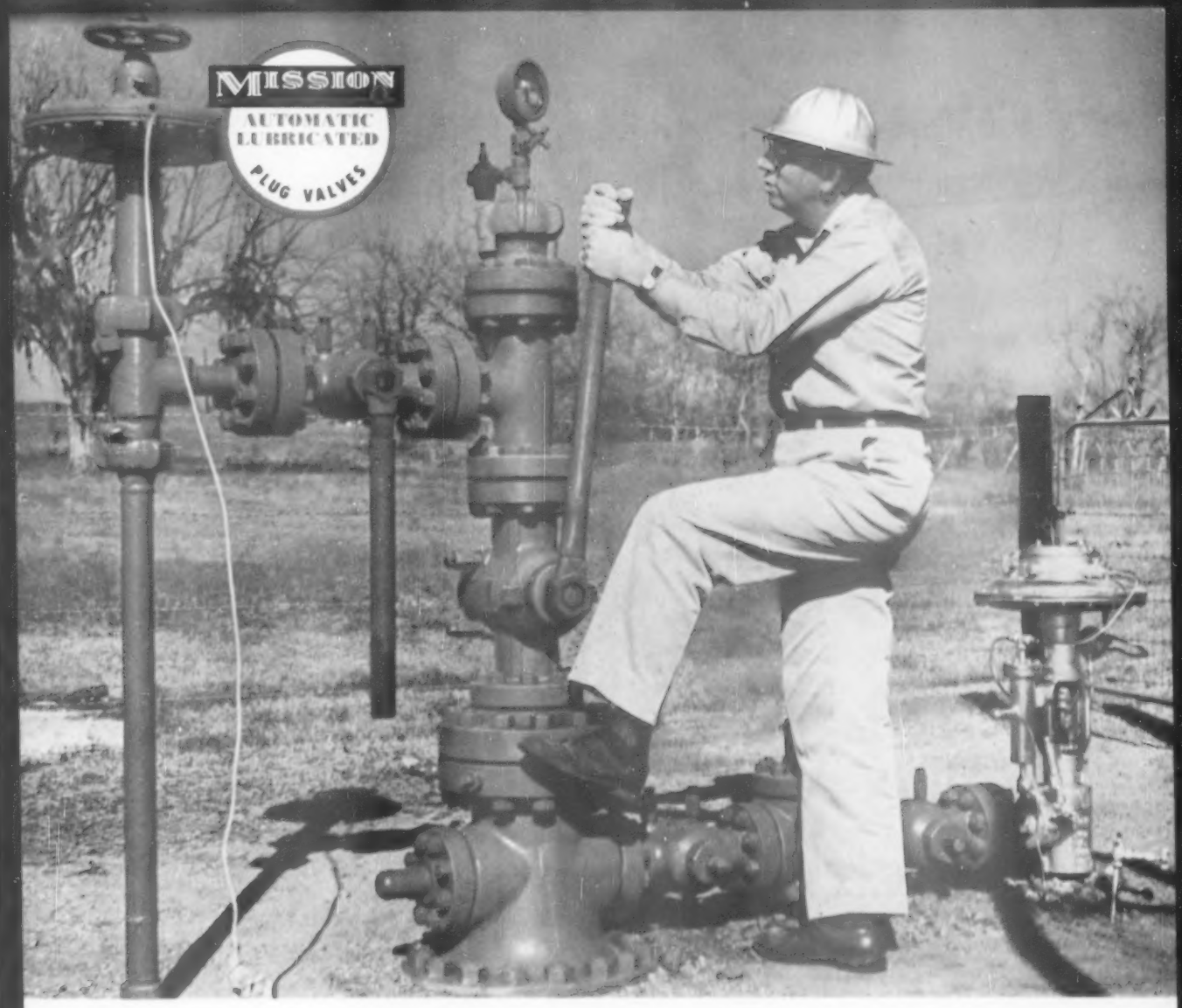

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